THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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ELECTRICITY AND THE MUNITIONS OUTPUT.

THE war has exercised innumerable influences on the electrical industry—some favourable, some injurious, and many whose effect has yet to be decided, partly by the general trend of events, and partly by the action, or inaction, of those whose interests are concerned. One fact, however, stands out clear-cut and unmistakable—our electricity works have deserved well of their country. The most cursory inspection of central station returns shows, in almost every instance, a remarkable development in power load connections during the last 12 or 15 months. At first sight this may seem to be merely a matter for selfish congratulation on the part of the central-station engineer—in other words, an instance of flourishing upon the national calamity. In fact, it is not outside the bounds of possibility that parties more zealous than discerning may seek to represent the increased power load revenue of such centres as Sheffield as "war profits" liable to taxation! Though the truth must be obvious to every electrical engineer, it is very doubtful whether the layman—even the layman in position of authority—realises that our 500 odd generating stations have been an enormous military asset during the past year. *Our present output of munitions would have been unattainable but for our electricity works.*

Though central-station generating costs were so low and the margin of profit on power sales was so small that perspicacious factory owners preferred purchasing to generating electrical energy, and electrification of new works was rapidly becoming the rule before the war, still there were a number of established workshops in which mechanical driving was retained for one or more of many reasons. Lack of capital, conservatism, and incomplete redemption on old plant were among the factors determining the retention of mechanical drive. In some cases the reliability and elasticity of steam engines were considered apart from the losses and defects in other parts of the mechanical installation; and in other cases the high thermal efficiency of gas engines was given undue importance.

With the outbreak of war a new era commenced. There was a temporary industrial paralysis or period of uncertainty, less acute and less enduring than in conscription countries, but still marked enough to permit many skilled men to enlist. Gradually the magnitude of munition demands became apparent, and with it the total inadequacy of mechanical driving and private power generation to meet the crisis. No doubt this inadequacy was realised by actual experience in many existing works, and it became immediately manifest wherever extensions or new works were planned. Every skilled man was needed in the workshops, and the depletion of private boiler room and engine house staffs by this cause and by enlistment became chronic directly night shifts doubled the minimum number of men with which operation could be continued. At a time when every effort was required to secure manufacturing materials and machinery the question of coal supplies and delivery became acute. Space, time, and labour required to secure and store a working margin of fuel could be better employed in other directions. Under continuous operation with depleted staffs, the satisfactory maintenance of private plant became impossible, and great delay was occasioned in obtaining replacement parts. To extend existing mechanical driving

equipment involved similar delays, and wastage of valuable space, besides merely multiplying most of the operating difficulties already enumerated.

These conditions were experienced in many works, and would have been experienced in all had electric driving not been already in use or promptly adopted. The electric motor with its efficiency, flexibility, and simplicity undoubtedly saved the day. The whole problem of power production was relegated to undertakings devoting their entire energy and resources to the subject. The technical efficiency and reliability of our central stations stood us in good stead. Increased demands were met instantly which could have been supplied by no other means, and the costs of production could have been approached by few private concerns under the conditions existing. Replacements and additions to the driving equipment were effected with no interruption of work, an absolute minimum of useful space was occupied by the driving motors, and, perhaps best of all, the total staff engaged in power production was reduced to a minimum, and practically no skilled labour was requisitioned in workshops to attend to the driving equipment. All these advantages, which have been existent for years past, though hitherto imperfectly appreciated, are still operative. They will be of military value till the end of the war, and after that use will surely continue to be made of them, and central stations will reap the full benefit of the national service which they are now rendering.

The exigencies of war have broken down those barriers of conservatism and hesitancy to incur capital outlay, which have so often in the past kept electric driving from what is technically and economically its own. Once broken, those barriers can never be rebuilt. In quieter days to come, the present experience with electric driving will withstand the most critical analysis, and now that every industry has been compelled to adopt electric driving from central-station supply, its advantages can never again be overlooked. In the meantime the electric motor and the whole of our central-station generating and distributing equipment are proving themselves equal to the most severe conditions ever known in industry, and, let us repeat, without them our present output of munitions would be literally impossible.

Rubber.

There have been a number of fluctuations in the prices ruling for plantation rubber since last writing, but, on the whole, the tendency of the market has been pretty satisfactory from the point of view of holders. Some very good buying has been experienced, mainly, of course, in connection with the supply of tires, and there has been no weight of raw material offering upon the market. The quantities coming to hand have been pretty good, but, as usual, extraordinary delay occurs in discharging, &c., and it is due to this that some difficulty was experienced from time to time in satisfying the demands coming forward from consumers. Under ordinary circumstances it would have been quite easy to satisfy inquiries, but the times are quite abnormal. As the demand tapered off, so the tone slackened, but there is no disposition even now to push sales, especially as rubber, in common with all other commodities which have to be imported, is suffering from the extreme degree of stringency affecting freights. There will probably be some interruption in the supplies reaching the United States owing to the traffic through the Panama Canal being entirely dislocated, and this may, perhaps, cause a diversion of demands from America to this side of the Atlantic, though it may be possible, of course, for vessels held up in the Canal to discharge their cargo and have it forwarded by rail. It is only relatively costly material, however, which could stand such an additional expense. American consumption is naturally proceeding on a very liberal basis, if only because of the huge war orders which have been placed there for motor-cars and tires by the Governments of the Entente Powers, and it is stated that the American automobile makers generally are running at record pressure in all parts of the country, and that the output of cars will mark a fresh high-water mark for this year. Below are given the usual details showing the exports of plantation rubber from the Straits Settlements for this year, with comparisons :—

	1913.	1914.	1915.
	Tons.	Tons.	Tons.
January	784	1,181	2,576
February	743	1,703	2,741
March	898	1,285	2,477
April	762	1,548	1,978
May	814	1,309	3,588
June	812	1,480	2 249
July	1,120	1,584	2,324
August...	1,315	1,325	2 295
September	1,057	1,602	4,725
Total	8,305	13,017	24,953

These figures include transhipments of rubber from various places in the neighbourhood of the Straits Settlements such as Borneo, Java, Sumatra, and the non-Federated Malay States, as well as rubber actually exported from the Colony, but do not include rubber exports from the Federated Malay States.

The position in Germany and Austria appears to be rapidly verging upon the critical. In Germany raw material is very scarce, and superhuman efforts are being made to turn out satisfactory grades of artificial rubber, but without much practical result, while the Government seems to have confiscated practically all the rubber in the country upon which it can lay its hands. In Austria the policy of confiscation has also been developed on a wholesale scale, as regards both raw material and all kinds of finished goods. It is generally believed that both Austria and Germany have placed large orders for crude rubber in neutral countries for importation directly the war is over.

The Electrical Position in China.

For some years past, in the pages of the Electrical Review, many writers have urged the needs of the Chinese electrical and engineering market upon the attention of British manufacturers.

It may be thought that the moment is unpropitious for repeating such advice. Those firms who enterprisingly placed their manufactures permanently on exhibition before the eyes of a continuous stream of Chinese students at Hong-Kong University will undoubtedly have their reward, if they have not actually received some of it already, but it were the height of folly to rest content with that. We commend to the notice of all our readers, and particularly those interested in the development of our foreign trade, the extracts which we publish to-day from an extremely valuable address delivered before the Birmingham and District Electric Club on Saturday last by Mr. W. G. L. Riddle. It would almost seem that notwithstanding all that has been written by expert observers of the situation, the dangers presented by the German activity of the last decade have been practically ignored by many of our own people, who really ought to have been in a position unitedly to put up a strong fight. Authority after authority has told practically the same tale—surely we can, even in war-time, be proceeding to adopt some well-thought-out policy which shall safeguard and extend British electrical interests in this vast territory in the future. Mr. Riddle is an electrical engineer, who looks at the matter through electrical eyes, and he recently returned from China; his advice and warning should therefore be the more readily listened to and acted upon. But what he says as an electrical authority is also said by the Government Special Commissioner, Mr. T. M. Ainscough, whom the Board of Trade sent out to China nearly a couple of years ago. He, too, has returned, and is in London at the disposal, within limits, of British traders, as already announced in our pages. He wants us all to be impressed with the seriousness of German competition in China, but while our wonder-working Fleet cripples German trade there is open to us such an opportunity as cannot recur. Mr. Ainscough's advice, therefore, is to act upon the opportunity that presents itself *now*. After the war China, like many other foreign and Colonial countries, will have immense requirements in engineering manufactures—are not development operations in arrears or in suspense practically everywhere?—and British factories will want to turn present munition workers on to peaceful occupations. Surely the facts of the position make their own imperative appeal to us!

German Stocktaking of Electrical Machinery.

Events now appear to be moving rapidly in Germany in connection with the problem of the supply of copper for munitions of war. A few weeks ago we referred to the protest raised by the leading electrical journal in that country against the expropriation, which then seemed to be in prospect in the near future, of electrical machinery and apparatus used in electricity supply works and power stations, it being contended that the copper used in the roofs of public buildings, church bells, and locomotive tubes should first be appropriated in the place of the former. It is quite possible that the work of stripping in the latter direction has already been carried out, or is in course of execution. If this were not the case it is improbable that we should hear, as was reported from Zurich on October 18th, that the military authorities in Berlin are proceeding to make an inventory of all electrical machinery, transformers and apparatus. All the machinery and apparatus of this kind which are to be found in warehouses or showrooms, and which have not had a dispensation from requisitions for the war, can be sequestrated. Affairs, therefore, are proceeding quickly, and stocks are to be seized before attempting to lay official hands on the plant in generating stations. On the face of it, the report appears to suggest that everything possible in the copper line which could be utilised, or which it would be advisable to utilise, has been removed from Belgium and the North of France; among the inadvisable removals would seem to be the copper used in connection with the tramways employed for military purposes, which, according to reports from Paris, are still running in some places, and, in fact, they are said to have run German officers and soldiers into the Bruges canal, whence the bodies of 114 were recovered a week or two ago. Already the iron and steel, particularly scrap iron, has been to a large extent taken from the occupied districts to Germany, where supplies of scrap from those localities are now expected to arrive in less abundance in the future than hitherto, for use in connection with the production of open-hearth steel. If, then, the iron and steel resources in the occupied territories are becoming depleted—we leave out of consideration the valuable iron ore mines in the basin of Briey, in the east of France, which are being worked by the Germans—how much more probable is it that all the available copper from those districts, which is more urgently needed by the army authorities than iron or steel, has been transferred to Germany, excepting in those cases where generating stations or tramways, as already mentioned, are being worked preferentially for army purposes! Under all the circumstances, affairs are tending in the direction of a gradual exhaustion of the copper resources of Germany, and the lapse of time will merely serve to accentuate this situation, and begin adversely to affect certain branches of industry. Since the foregoing was written, German newspapers have arrived in this country, confirming the Swiss report already mentioned. The official announcement shows that the obligation has been placed upon all owners of electrical machinery, transformers, and apparatus, which are now in stock, or which can be dispensed with during the war, to notify the stocks to the Electrical Machinery Distribution Bureau of the Ministry for War in Berlin by means of the prescribed notification forms. The information had to be furnished by October 25th for machinery and apparatus up to 100 in number, whilst five days longer are being allowed for notifications where the number exceeds 100, so that the whole of the details should be in possession of the army authorities by to-morrow.

A Russian Tax on Electricity.

The question of taxing electrical energy in Russia, which is now seriously occupying the attention of the Government, was agitated as long ago as the eighties of last century, says a Petrograd journal. On the last occasion the proposal was not brought formally under the notice of the legislative bodies, chiefly because industry revived, and there was an abundant harvest, which reduced the necessity for seeking new sources of revenue for the Government. The present altered state of affairs requiring the expenditure of immense sums of money finds the Government obliged, it is stated, to extend taxation to electrical energy. In 1913 the Ministry of Finance collected data throughout the Empire on all electrical concerns then existing, including central and private electric stations. A comparison of these data with those of 1905 shows that during the eight years the electrical industry made excellent progress, and our contemporary says that at the present time it is quite strong enough to bear taxation. We have ourselves already questioned the wisdom of the proposal, but must accept our contemporary's statement at present. In 1913, the total consumption of electrical energy in the Russian Empire could be stated as 2,000 million KW.-hours, of which about 20·5 per cent. was used for illumination and 79·5 per cent. for power and other industrial purposes. The total consumption had increased four times. The tax, according to the new project, affects all electrical energy used for lighting, heating, power, and other industrial requirements, but excluding current used for the Treasury and Government buildings, constructions, and establishments, current obtained from installations the output of which does not exceed 1 KW., current used for illuminating the rolling stock of private railways, or communal railways, and so on. The tax on the energy delivered from central stations is fixed at, per KW.-hour, (*a*) 4 copecks for lighting private rooms, isolated houses and farms, the rooms of factory employés, commercial establishments, theatres, &c.; (*b*) 2 copecks for lighting factory establishments, and workmen's dwellings connected therewith; (*c*) 1 copeck for lighting streets, public places and gardens maintained at the cost of towns or other public bodies, railway station platforms and lines on private railways used for public purposes, &c.; (*d*) ½ copeck for heating, locomotive, and other industrial purposes, not included specifically under *b* and *c*. Electrical energy applied in the household for heating, driving, and other industrial purposes obtained from the system of lighting wires without being measured by special meters is subject to a tax of 4 copecks per KW.-hour. The tax on electrical energy is payable to the Treasury by the owners of stations who on delivering the current to outsiders—that is, subscribers—may transfer the tax to the latter.

A special consultation on the subject of the tax with the participation of representatives of the industry was to be held at the Ministry of Finance a fortnight ago, but we have not yet received any information respecting what transpired.

Wireless Telephony.

As we remarked not long ago, amid the clash of arms, Science placidly pursues her way, hampered undoubtedly by the world-war, but undeterred in her high aims. It is but a few months since we recorded the successful accomplishment of trans-Continental telephony over loaded lines; we now have to congratulate our American friends once more on what may well be regarded as a still more striking achievement—the transmission of speech over a distance of 4,900 miles, without the aid of a connecting wire. But for the war, this country might have shared in the work; certainly we may claim credit for some of the foundation stones upon which the superstructure has been raised, in the work of Sir Oliver Lodge, Prof. Fleming, and Mr. O. W. Richardson. Apparently the factor which has played the leading part in rendering possible this new triumph of science is the principle of thermionic currents, as exemplified in the pliotron, which we described in our issue of May 28th. That was developed by Dr. Langmuir, of the General Electric Co., U.S.A.; but before that time Dr. Lee de Forest had developed his audion, which resembles the Fleming vacuum valve that is so widely used as a receiver in wireless telegraphy. We do not yet know to whom the credit of providing the corner-stone of this great work is justly to be ascribed; but we do heartily congratulate all these gentlemen, and Mr. J. J. Carty, under whom the experiments have been conducted, upon the splendid achievement to which their labours have contributed.

LONDON AND SOUTH-WESTERN RAILWAY ELECTRIFICATION.

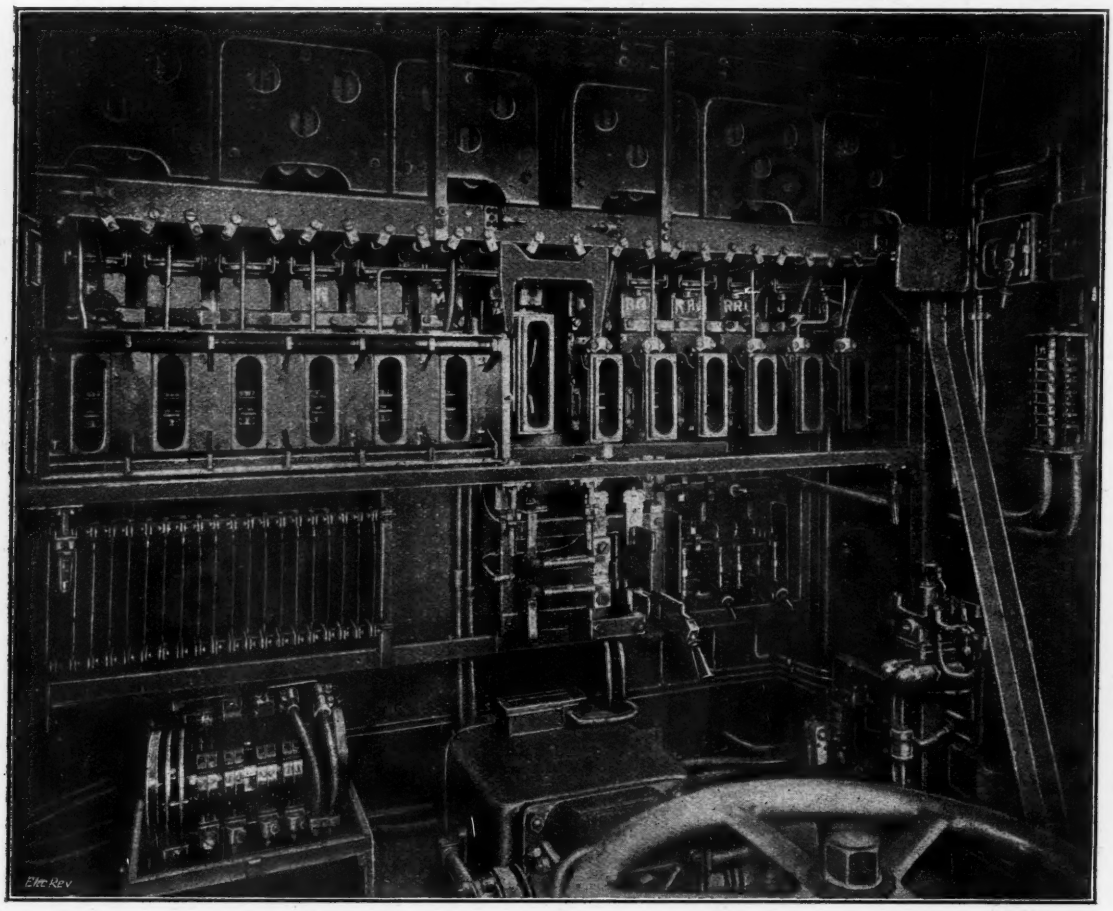
(*Concluded from page* 464.)

There are seven frequency changing sets in all, the generator in each case being an open type single-phase alternator, with direct-coupled exciter. They were all supplied by Messrs. Bruce Peebles & Co., Ltd. In three of the sets, the single-phase generator is driven by a D.C. motor, while in four of the sets the single-phase generator is driven by a slip-ring induction motor fitted with the makers' patent short-circuiting and brush-lifting gear. Two of the former class were illustrated on p. 464, these being installed at the power house.

The four sets which are driven by induction motors will be installed respectively at the Raynes Park, Twickenham, Clapham Junction, and Waterloo sub-stations.

provided with balanced relays at the feeding end and balanced reversed power relays at the receiving end. Two lengths of single feeder are fitted with Merz Price protective gear, in connection with which three-core pilot cables have been provided.

The 11,000-volt supply is distributed to nine sub stations, where it is transformed down and converted to continuous current at 600 volts, at which pressure it is delivered to the conductor rails on the track. The sub-stations are situated at Waterloo, Clapham Junction, Raynes Park, Hampton Court Junction, Kingston, Sunbury, Twickenham, Isleworth and Barnes. They contain transformers, rotary converters and the necessary high and low-pressure switch-



Reversing switch. Air-compressor. Brake governor.

FRONT VIEW OF CONTACTORS IN DRIVER'S COMPARTMENT, SOME WITH ARCING BOXES REMOVED (ON THE RIGHT); CIRCUIT-BREAKER IN CENTRE.

The speed of the D.C. motor sets is 900 R.P.M., while that of the induction motor driven sets is 722 R.P.M.

The 3,300-volt feeder cables are 0·05 sq. in., twin-core, paper-insulated, copper-taped, lead-sheathed, wire armoured, and served, and are divided into sections at the transformer chambers, where they are connected to oil switches. These oil switches are fitted with trip coils operated by relays, having operating coils connected to the copper tapes on the cables. In the event of a fault developing on a length of cable, the relays at each end of the defective length come into operation, and trip the oil switches, thus cutting out the length.

A large proportion of the 11,000-volt feeder system is in the form of a ring main, and where duplicate cables are provided in this ring, they are fitted with protective gear consisting of balanced relays, which, in the event of a fault, isolate the length of defective cable at both ends. Duplicate cables which do not form part of the ring main are

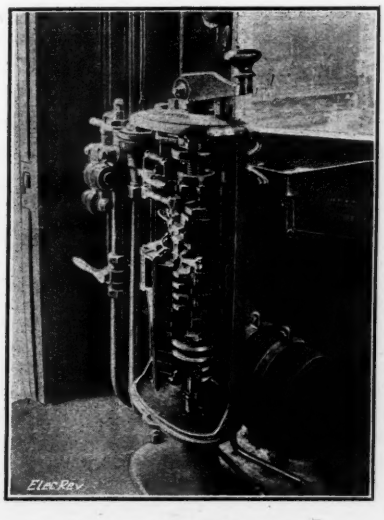
gear. The rotary converters, which were made by the British Thomson-Houston Co., Ltd., are of two sizes, viz.: 1,875 and 1,250 KW., and each of them is supplied by three single-phase oil-cooled transformers.

The high-pressure switchgear is completely enclosed in moulded stone cells, and, with the exception that the oil switches are hand-operated, is similar in construction to that installed at the power house. Each of the D.C. feeder panels controls two circuits, each of which has a maximum capacity of 5,000 amperes. The feeder circuit-breakers are equipped with indicating lamps which, when the breakers are open, show the position of the breaker through which the different sections of conductor rail are fed from the next sub-station.

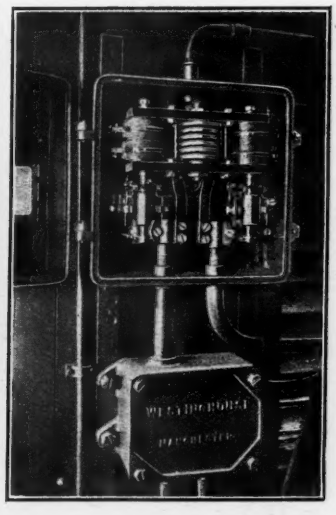
The track work involved in the electrification comprises the laying of a third rail and the bonding of the running rails of about 150 single-line miles of railway.

The conductor rail is laid at one side of the track 16 in. from gauge, and 3 in. above rail level; it is of special high-conductivity steel, and weighs 100 lb. per lineal yard. The resistance is approximately $6\frac{3}{4}$ times that of copper of equal cross section. The rail is bent down at the ends to form the ramps, and is bonded at the joints with four copper bonds having a total cross-sectional area of 1·4 sq. in.

The jumper cables connecting adjacent lengths of conductor rail at crossings and other points where it is necessary to have a gap in the rail, are of 1 sq. in. sectional area, and are made up of 127 0·101-in. diameter copper wires insulated with rubber, bitumen sheathed and braided.



Masier Controller, open.



Automatic Relay.

All the low-pressure rubber and bitumen feeder cables from the sub-station to the track, together with all the jumper and cross-bonding cable for track work, were made and laid by Messrs. Chas. Macintosh & Co., Ltd., who also manufactured and supplied all the lighting and control cables used in connection with the rolling stock.

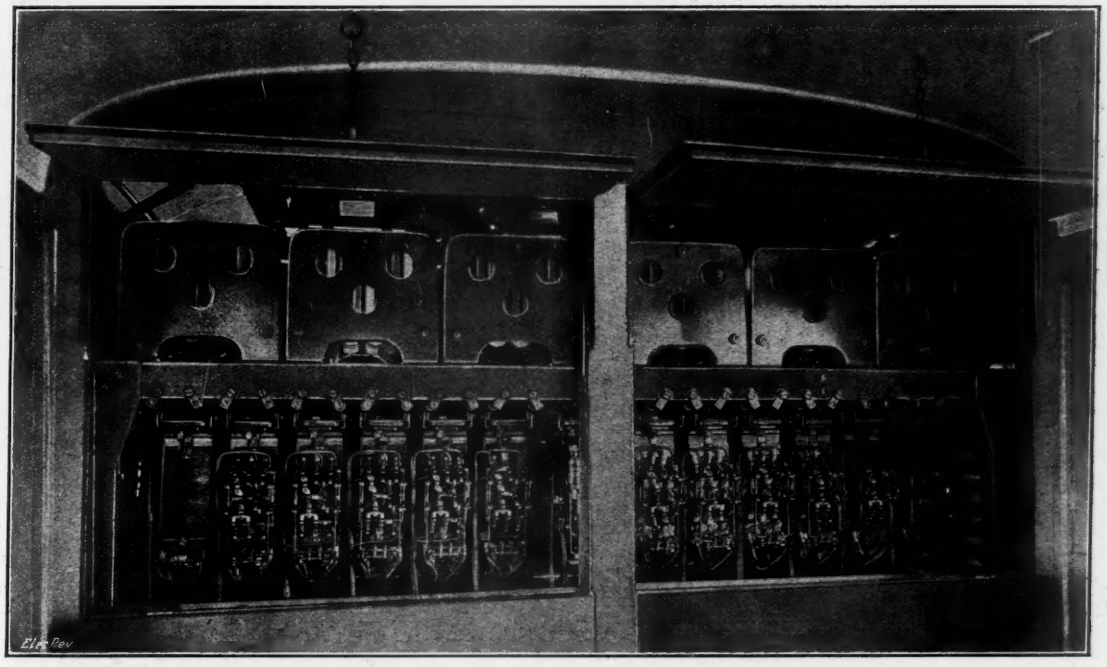
The return circuit is formed by the running rails, the joints of which are bonded with two copper bonds of the protected type placed under the fish-plates. These bonds are made up of copper strips, and have a total cross-sectional area of ·33 sq. in.

The rolling stock consists of 252 51-ft. compartment-type coaches which were until recently used in steam service and have been converted for electrical working. The stock is made up into permanent sets of three coaches, and is equipped with multiple-unit control, so that trains may be formed of one or two three-coach units in accordance with the requirements of the traffic.

Each three-coach unit has a motor bogie carrying two motors under each end, weighs 94 tons unloaded and seats 190 passengers. The motors have been specially designed to meet the requirements of the service, and are each rated at 275 H.P. on the usual traction motor basis.

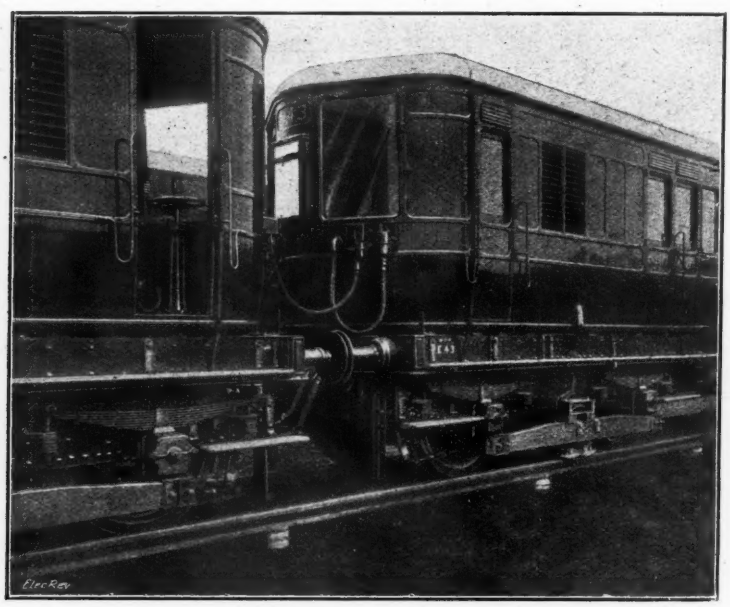
The control equipment is of the relay automatic type in which the rate of acceleration is governed by a relay. The relay is controlled partly by the motor current, and partly by a dashpot time lag. Marks will be fixed on the line to indicate to the motormen when to shut off current, and this, in conjunction with the automatic control of the rate of acceleration, will enable the most economical method of running to be adopted.

The motors run at 590 R.P.M., and are geared 21/59 on standard $42\frac{1}{2}$ in. driving wheels. All the electric control gear is placed in the driving compartments at opposite ends of the unit, each pair of motors being controlled by its own set of control gear. The arrangement of the control gear in the driver's cab was decided upon by the railway company's engineers in preference to having it underneath the coach, on account of the greater ease of access for inspection, cleaning and adjustment. The positions of the individual pieces of apparatus have been carefully arranged with this end in view. Access to the control apparatus is obtained on the one side from the driver's compartment and on the other through large hinged doors in the partition



Contactors seen from the rear, showing the Interlocking Switches.

between the driver's and luggage compartments. There is an advantage in placing the control apparatus in the driver's cab, in that the weight of this apparatus comes over the driving bogie, and so increases the adhesive weight on the driving wheels.



Coupling between two Three-coach Train Units.

We give herewith views of the control apparatus from front and rear, of the master controller, and of the automatic accelerator. Another view shows one of the motor trucks, together with the interior of the car depôt, which adjoins the power house.

The motors are of the totally-enclosed type, with commutating poles; the field poles are laminated, while the interpoles are made solid and have a special shape of tip. Spring washers are used in both cases to keep the coils firm in their places and to prevent chafing due to vibration.

A fan is provided on the armature for air circulation on the axial system; air drawn through openings in the commutator spider and armature core passes through the fan and back between the field coils, and over the armature and commutator. Openings to the atmosphere are not provided, the whole of the cooling being done by radiation from the case, but the circulation of air ensures even temperature throughout the motor.

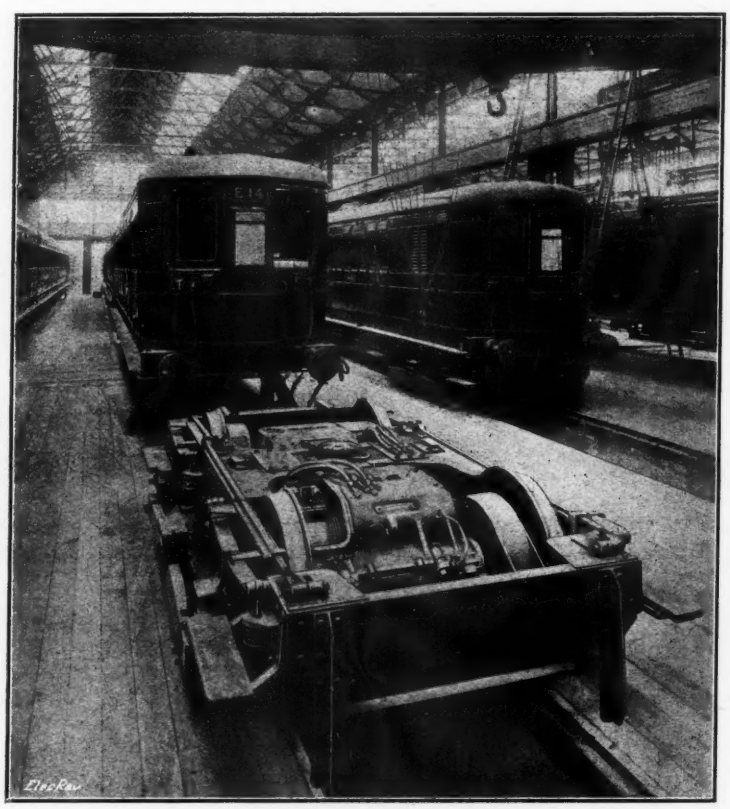
The lubrication of all bearings is effected by means of long fibre wool waste, which siphons the oil up to the bearings and provides a continuous and automatic supply. A separate oil reservoir permits the fresh oil to be fed and filtered up through the waste to the bearings, and suitable oil wiper rings and guards prevent the oil from the bearings getting into the motor casing. The oil thrown from the wiper rings passes to a waste pocket of ample capacity in the bearing housing from which it may be drawn off periodically.

The motor casing is carried by a suspension bracket, which is supported through rubber springs from the truck transom. The control of the trains for multiple unit working is effected by the Westinghouse Co.'s "All Electric" system of automatic relay control. In this system the motor current is handled by a suitable number of electrically-operated contactor switches, the operating coils of which are connected to control wires running throughout the length of the train, and actuated by six small motor controllers. The contactors are provided with interlocking switches connected in their operating circuits, to ensure the correct sequence of changes in the connections.

The motor equipment on each coach is controlled during the accelerating periods by its own relay, which is independent of the other relays on the train; hence the motors on the different coaches are notched up in accordance with their individual requirements, which are, in a measure, dependent upon the diameter to which the wheels may be worn and the slight inherent differences in the characteristics of the motors. This system, therefore, helps to equalise the load on the different motor coaches and gives a low energy consumption.

With this system the master controller becomes a very simple piece of apparatus, and this is important, because it is the only piece of apparatus handled by the drivers, who are generally non-technical men. The operation of the controller is extremely simple, the driver having merely to move the controller right round to the full "on" position, and the relays automatically do the rest.

Powerful magnetic blow-outs are fitted to all pieces of apparatus where there is a possibility of arcing when breaking current. The arcing tips are of hard-drawn copper, which can be easily and cheaply renewed. A wiping action between the contacts is provided, so that any roughness due to arcing when opening the circuit does not interfere with



Motor Truck, and interior of Car-repairing Shed.

the contact surface when the switch is in the closed position. Each contactor and circuit-breaker is carried by a pressed steel plate clamped to mica-insulated steel tubes, which are fixed to two channel irons running the full length of the switch group. This method of construction is light and strong, and has the necessary flexibility to withstand vibration. It also renders the withdrawal and replacement of a contactor switch an extremely easy matter.

The interlocking switches mentioned above are fixed at the back of the contactor switches, and are operated by a lever from the movable core of the contactor solenoid, thus ensuring a definite position of the interlocking switch, corresponding with a definite position of the contactor. These interlocking switches have been most carefully designed with a view to ready inspection, renewal and withdrawal when necessary. The smallest possible number of different parts is used in the construction.

The frame carrying the contactor switches forming the motor-car group lies across the width of the coach in the driving compartment. It also carries the necessary motor-starting resistances, and the main fuse above the contactors. The motor resistances are of the usual three-point suspension grid type, mounted on mica-insulated tie-bars fixed to pressed steel end frames, giving a strong and rigid construction.

Views of the back and front of the switch group are shown herewith, from which may clearly be seen the interlocks at the backs of the switches, and the arcing tips and arcing boxes at the front of the group. The circuit-breaker is similar in construction to the contactor switches, and may be seen in the middle of the group. It is provided with heavy laminated brushes in addition to the contact jaws, and adjustable overload and trip coils.

The reverser is of the drum type. The drum castings are clamped to mica-insulated shafts provided with heavy copper contact segments. The fingers are made with renewable tips, and provided with swan-neck finger springs and heavy copper shunts. The finger bases are clamped to mica-insulated bars. The interlocking of the control circuits for operating the reverser is effected by an additional contact drum attached to the main spindle, so that a fixed relationship between the making and breaking of the main control circuits is obtained. A powerful magnetic blow-out is provided for the interlock fingers, which are identical with the swan-neck fingers used in the master controller.

The master controller is of the drum type, and is provided with both main and reversing handles, so interlocked that the reversing handle must be in either the forward or the reverse position before the driver can operate his controller. The main handle embodies the "dead man" feature, the arrangement being such that in the event of the driver releasing the handle the supply of control current is interrupted, thus opening all the main contactors, and the brakes are automatically applied. Should the driver allow the handle to move upwards at any time, he must bring the operating handle to the "off" position again before he can release the brakes. When coasting and when making ordinary service stops the driver moves the main handle to the "off" position and keeps his hand on the handle, thereby preventing the interruption of current and the automatic application of the brakes.

The main handle of the master controller has four operating positions:—The first position, usually called the "switching" position, gives series connections to the motors with all resistance in circuit; the second position brings the automatic relay into operation, and the resistances are cut out of circuit step by step until full series is obtained; the third position connects the motors in parallel, the well-known bridge connection being used in passing from series to parallel; the fourth position brings the automatic relay into operation again, cutting out the resistance step by step until full parallel is obtained. It is unnecessary to pause on each notch of the controller until the corresponding motor connections are completed; the handle may be moved directly to either the series or parallel position, when the control apparatus automatically notches up step by step until the position is reached corresponding to the particular notch on which the handle is placed.

The starting current, and therefore the rate of acceleration, may be adjusted by means of the setting of the automatic relay; this relay consists of three coils, two of which have movable plungers fitted with copper disks for bridging contacts in the control circuit, the three coils having a common magnetic circuit. The two coils which have movable plungers are connected in the control circuit, and the third coil is a heavy-current coil connected in the motor circuit. The function of the two coils in the control circuit is to lift the short-circuiting copper disks and thereby open one of the control circuits, the disks being held up until the motor current in the series coil has fallen to the pre-determined value for which the relay is adjusted. The contacts in the relay are never used for breaking circuit, and are, therefore, not liable to cause trouble by burning.

The construction of the control apparatus throughout is of non-inflammable material, and the whole of the insulation is of mica.

Practically all the wiring is in the driver's cab, and the connecting train wires and through shoe cable are fixed on the roof of the coach so as to be quite out of reach of unauthorised persons.

The lighting of the compartments has been the subject of very careful study by the railway company's engineers, and a suitable and tasteful fitting has been adopted. The coaches are heated by electric radiators suitably grouped in the various compartments.

The Westinghouse brake used on the electric trains employs cylinders 12 in. and 14 in. in diameter, and the triple valves are of the newest design, which passes on the operation of the driver's brake valve to the rear of the train by a quick serial movement, resulting in the almost simultaneous application of the brakes on a train 600 ft. long, which ensures a smooth and efficient brake service.

The air is supplied to the brake system by small compressors direct-driven by low-speed motors, one of which is placed in each motor-car. The action of all these compressors on a train is controlled by a master governor and switch, which produces uniform compressor labour throughout the train, as all compressors start and stop simultaneously. This arrangement is known as the Westinghouse Governor Synchronising System.

The work on the permanent way has consisted for the most part of the equipment of the existing tracks for electric traction; but a fly-over junction has been constructed at Hampton Court Junction to prevent the crossing of the new electric trains on the level. The new piece of line, which is 1½ miles in length, includes a steel girder bridge of 160-ft. span, which carries the track for the electric services over the existing line at the junction, and which is the longest single span bridge on the London & South-Western Railway. The work also includes two brick arch viaducts 330 and 100 yards long respectively, as well as several road bridges. The whole of this work is now completed.

The week-day train service arranged for between Waterloo and Wimbledon, which began on Monday last, provides trains every 20 minutes from about 6 a.m. to midnight. The new schedule, though all trains serve every station on the route, involves a considerable acceleration upon the times hitherto in force, the journey from end to end being reduced from 31 to 24 minutes.

In view of the fact that steam trains were relatively infrequent on this branch, often an hour or more apart, residents of the East Putney, Southfields and Wimbledon Park districts will benefit considerably.

The schedule time between Waterloo and Teddington will probably be reduced from 50 to 33 minutes.

New Electrical Manufacturing in Sweden.—According to notices in the Swedish Press, the L. M. Ericsson Co., of Stockholm, which has hitherto been more closely associated with the manufacture of telephonic apparatus, has lately commenced the production of electric signalling apparatus for railway block systems. This type of machinery has hitherto been mainly imported into Sweden from Germany, and it is expected that the new departure will render the country independent of foreign manufactures.

ELECTRICITY EXTENSIONS AT STEPNEY.

The modern generating station of the Stepney Borough Council, which is situated on a riverside site at Limehouse, was first brought into use in the autumn of 1909. The various plant additions made since that date, in order to cope with the rapid electrical development of the East London area, soon filled the original buildings, and, as far back as 1912, Mr. W. C. P. Tapper, the borough electrical engineer, in a report advised the doubling of the station buildings, and immediate installation of turbine, boiler and auxiliary plant, at an estimated cost of nearly £138,000.

This scheme of extension has now been carried out, and, as briefly recorded in our last issue, was officially inaugurated on a recent date.

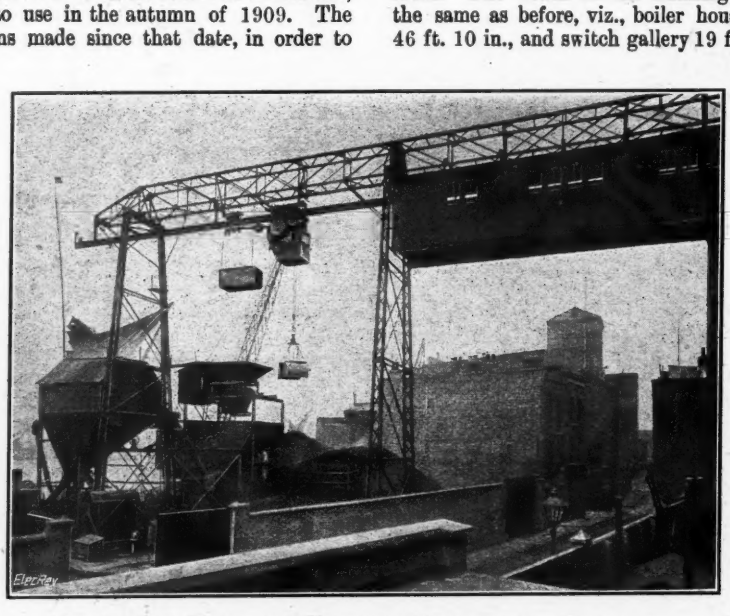


Fig. 1.—Coal Wharf and Electrical Telpher; also Screen for Condensing Water.

The buildings have been extended at their northern end by the addition of three ferro-concrete bays (two of which are occupied by the new plant), and comprise an engine room and switch-gallery section, with basements; a boiler house section, with overhead coal bunkers, and an ash basement. The width of the building remains approximately the same as before, viz., boiler house 63 ft., engine room 46 ft. 10 in., and switch gallery 19 ft. 6 in., but the heights have been somewhat increased, the boiler house by some 15 ft. to 19 ft., to allow room for a double telpher track for coaling the bunkers, and for the hot-air economisers, draught fans and motors, and the engine room by 15 ft., to accommodate larger condensing plant and allow for the handling of a 50-ton electrically-driven overhead travelling crane.

In the boiler house the new equipment consists of four water-tube boilers of Messrs. Howden's make, built for a normal evaporation per boiler of 33,000 lb. of water at 150° F., to steam at 200-lb. pressure, with a heating surface of 6,700 sq. ft. and 190 sq. ft. of grate area. Each boiler is in six elements with upper and lower drums connected

Fig. 2.—Interior, Limehouse Generating Station, showing the New Turbine Plant in the distance.

together with about 6,700 2-in. vertical tubes, and the necessary balancing water and steam pipes between the drums; each element is provided with a safety valve, and there are two feeds to each boiler, while each boiler is fitted with internal superheaters.

The stokers (two to each boiler) are of the Underfeed

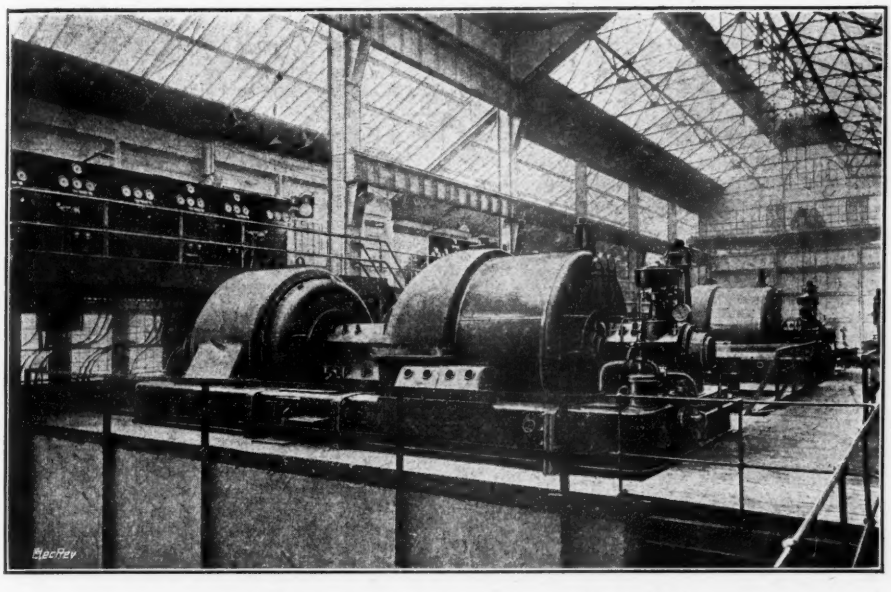


Fig. 3.—5,000-kw. Escher, Wyss—Brown, Boveri Turbines, Limehouse Generating Station.

Co.'s moving-grate type, and are worked in conjunction with their hot air economisers, forced draught and Prat patent induced-draught chimneys, with the object of obtaining as nearly as possible a balance draught at the stoker grate level; the economisers, two to each boiler, are placed in the flue immediately above and under the chimney. Each boiler is equipped with an induced-draught fan and forced-draught fan, mounted close to the base of the Prat chimney, and is provided with a gauge board with the following ten instruments:—Steam gauge, two superheat gauges, the forced-draught motor ammeter, shunt regulator and draught gauge, the induced-draught motor ammeter, shunt regulator, and draught gauge and the balanced draught gauge, thus enabling the stoker to keep the working conditions of the boiler always under observation. The stoker drive is suspended on the under side of the boiler-house floor and operates patent spring clutch gear to give motion to the grates.

The ash-handling for the four new boilers is carried out on the lines of the original plant by means of hoppers under each furnace emptying into movable runabout skips, these latter being conveyed by means of the telpher to the ash hopper upon the wharf edge.

The coal-handling plant extension consists of a double mono-rail telpher track running over the tops of the coal bunkers, and one track extends for 20 ft. into the yard at the north end of the building; this is coupled up to the original single mono-rail track, and was supplied by Messrs. Strachan & Henshaw in order to cope with the increasing coal supplies, and to ensure continuous working in the event of a breakdown to either of the telpher machines.

For handling the coal stock at the north end of the boiler house a 3-ton electrically-driven jib crane, manufactured by the Chatteris Engineering Works Co., has been erected, with a maximum working radius of 45 ft. A coal-receiving and discharge hopper is provided in the yard at the end of the telpher track. It might be mentioned that this crane is mounted upon a travelling undercarriage, 10 ft. high, with a view to its being used later on the river wharf. When working in conjunction with a Priestman's grab it is capable of dealing with 40 tons of coal per hour.

A Weir steam turbine-driven feed pump of 10,000 gallons per hour capacity has been added to the boiler feeding plant, the exhaust steam being turned direct into the hotwell overhead through a kinetic heater.

The extension of the engine room consists of two 5,000-kw. Escher, Wyss turbines of the Zoelly impulse type,

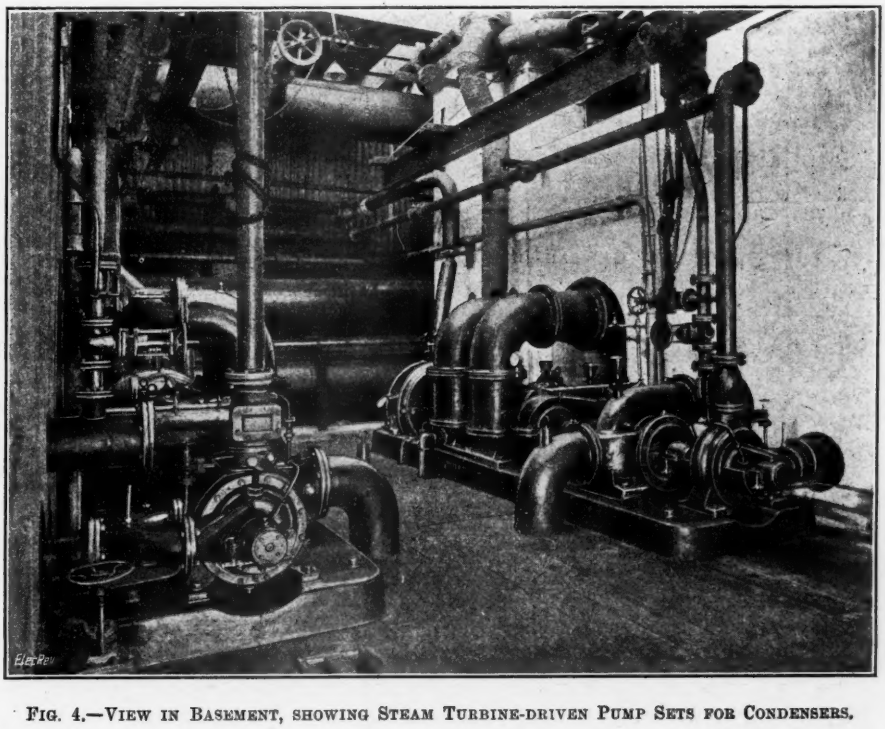


Fig. 4.—View in Basement, showing Steam Turbine-driven Pump Sets for Condensers.

coupled to two Brown, Boveri three-phase alternators, generating at 6,600 volts between phases and 50 periods. These sets are capable of generating 25 per cent. overload for two hours and 50 per cent. overload for half an hour, running at a speed of 1,500 r.p.m. They operate on steam at 180 lb. at the stop valve, temperature 500° F., and the

specified full load steam consumption at unity power factor is 13·31 lb. per KW-hour, subject to a tolerance margin of 2½ per cent.

Cooling air is supplied to each machine through sheet-iron ducts by a Heenan and Froude air filter, of 25,000 cb. ft. per minute capacity. These filters are placed in the basement, and the necessary water supply for them is led from the condensing plant.

The surface condensers, placed immediately below the turbines, each have 10,760 sq. ft. of cooling surface, with a wrought-iron cylindrical shell, and each is provided with a steam-driven pumping set, consisting of a steam turbine driving a circulating water centrifugal pump, rotary air pump, condenser extraction pump and hot well force pump, in tandem, at a speed at 2,000 R.P.M.

The exhaust steam from these auxiliary turbines can be turned either into a stage of the main turbine or into the hot well by means of a Holden and Brooke kinetic heater, thus, in the latter case, regaining the latent heat units of the steam. Either condensing plant can be used with either turbine, or, in case of emergency, both turbines could be run on reduced loads upon one or other of the condensing plants; an alternative atmospheric exhaust is also provided.

A 50-ton Stothert and Pitt electrically-driven overhead crane has been provided for the engine-room extension. This is equipped with three motors, each running at 700 R.P.M., for lifting, travelling, and hoisting respectively.

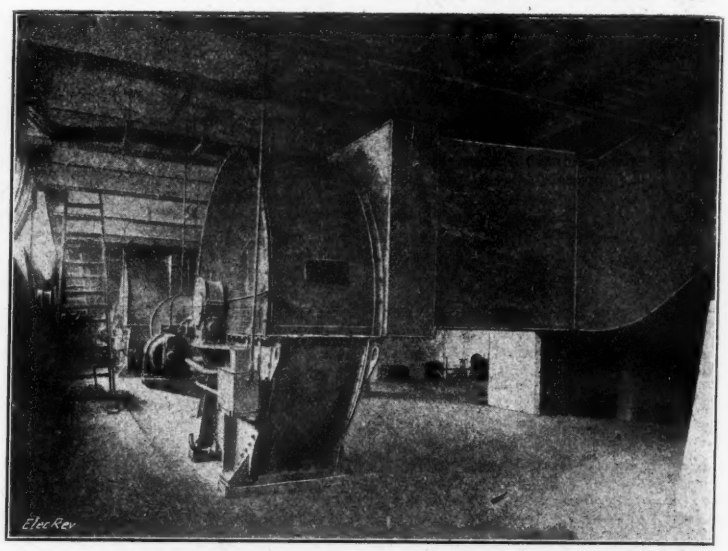


FIG. 5.—AIR FILTERS AND TRUNKS TO TURBO-ALTERNATORS.

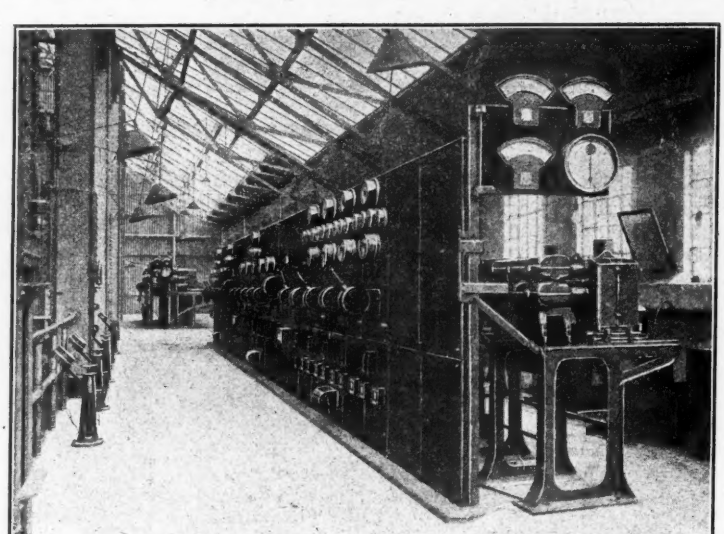


FIG. 6.—GENERAL VIEW ALONG SWITCH GALLERY, LIMEHOUSE GENERATING STATION.

Between the two 5,000-KW. alternators, a Bruce Peebles 1,000-KW. motor converter has been intalled, which is similar to those which have been in operation for some years in the generating station and sub-stations.

The whole of the necessary pipework, together with all valves, cocks, separators, traps, lagging, and fixings have been provided by Messrs. Babcock and Wilcox, Ltd.; practically the whole of the steam, exhaust and drain pipes are confined to the boiler-house section, and the river water pipes, cold water pipes, air pump discharge pipes are in the engine-room basement; the steam traps are of Messrs. Alley & MacLellan's make.

In order to secure greater safety in the running of the motor-driven auxiliary plant, alternator field excitation and pilot lighting of the station, a D.P. battery of 260 cells has been installed, with a combined battery-booster and feeder-booster of Messrs. Siemens's make, together with the necessary switchgear, for charging purposes. Under normal conditions the battery will be floating across the main D.C. bus-bars, but should the main bus-bar supply from any cause fail, or the pressure drop abnormally, the rush of current from the battery brings out a pair of three-way overload breakers, one in the positive side and one in the negative side of the system, instantaneously cutting the battery off the bus-bars and leaving it on the auxiliary power circuit. In addition, should the motor of the booster set be cut off from the supply, and allow

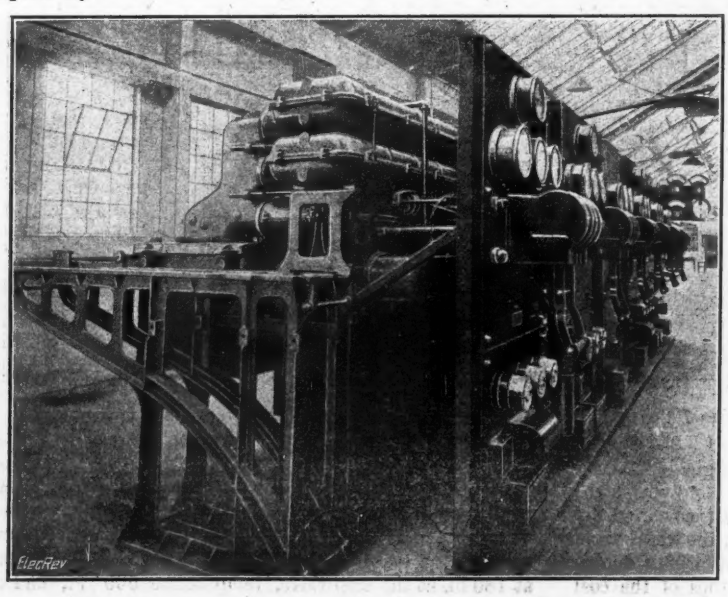


FIG. 7.—REYROLLE E.H.T. IRONCLAD SWITCHGEAR EXTENSION.

the boosters to race upon a weak field, change-over switches are operated by a pair of relays coupled across the brushes of the motor, thereby cutting out the boosters.

An additional works power board by the G.E. Co. has been erected in the new engine room to control the additional motor circuits.

The switchboard gallery has been extended, and six panels of Messrs. Reyrolle's new extra-high-tension ironclad gear have been installed there, together with the rheostat regulating gear for the alternator fields. The above gear

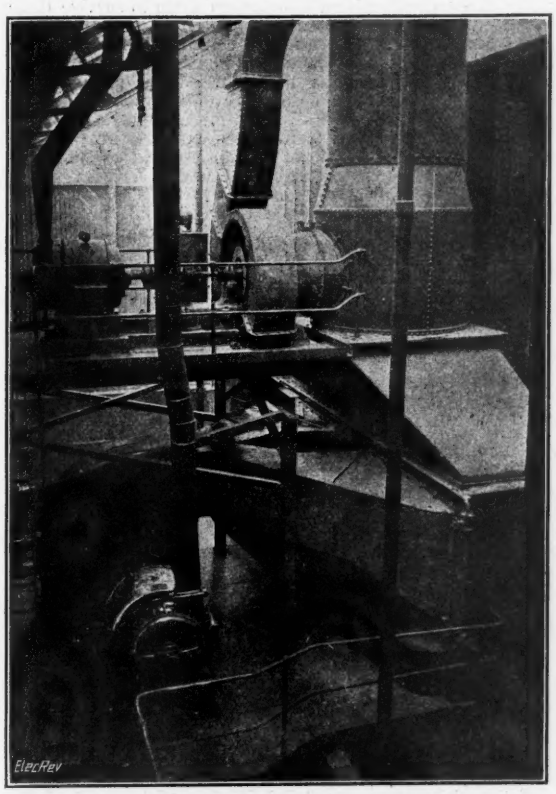


Fig. 8.—Forced and Induced Draught Fans, Boiler House, Limehouse Generating Station.

includes two machine switches, two bulk supply panels and two coupling switches. Following upon the original lines there are duplicate three-phase bus-bars, the section of each bar being 1 sq. in. The switches are contained in boiler plate tanks, with cast steel tops.

The whole of the circuits to and from the switchgear are protected with Merz-Price protection. In addition, the generator panels are provided with rotary type field switches with an electrical interlock between them and the main switch, which prevents the field switch from being opened before the main switch, and provides for the automatic tripping of the field switch when the main switch operates, and ensures that the field switch is closed before the main switch. The fields of the exciter are separately excited at 240 volts from the L.T. direct-current supply. The panels are also provided with all the necessary synchronising sockets, signal lamps for "switch on" and "switch off," power factor indicators and open-dial type ammeters and wattmeters for each phase.

A Brown, Boveri automatic field regulator has been furnished for each alternator, and an electrically controlled governor switch for each turbine to regulate the speed direct from the gallery. The coupling switches are for the control of the cables running between the bus-bars of the new board and the bus-bars of the old board. Upon the old board are also inserted two coupling switches, one in each bus-bar. In order to provide space for these latter switches in the old board, various panels and circuits had to be rearranged, including the two Poplar bulk supply feeders. These latter have now been transferred to the new board and provided with the new type extra-high-tension switches, thus securing a switch of larger capacity. All the above necessary alterations have been carried out by Messrs. Reyrolle, who have also supplied the additional D.C. panels.

In order to cope with the increase of load and the bulk supply demands from Shoreditch and Bethnal Green, the following additional feeders, converter and switchgear have been provided:—Two 1,500-KW. E.H.T. feeders from the Limehouse generating station to the Whitechapel sub-station; two 1,500-KW. E.H.T. feeders from the Whitechapel sub-station to Shoreditch; and two 1,500-KW. E.H.T. feeders from the Whitechapel sub-station to Bethnal Green.

All these feeders have been provided with pilot cables for Merz-Price protection gear, and E.H.T. Reyrolle switchgear has been added to the respective sub-station switchboards to control these feeders.

At the Wapping sub-station an additional 1,000-KW. Bruce Peebles motor converter has been installed; the three-phase E.H.T. machine and the two D.C. machine panels complete were erected under Messrs. Reyrolle's contract.

In addition to recently installed plant, the Limehouse station also contains four smaller turbine sets, one being a Parsons tandem direct-current machine, while the others comprise three Peebles three-phase turbo-alternators coupled to Parsons and Willans turbines, the total capacity of this plant being some 6,500 KW. Including the new motor-converter set, to which reference has been made, there are now three 1,000-KW. Peebles machines, and one smaller set of this type in the station.

Practically the whole of the main switchgear is of the Reyrolle ironclad type, as shown in one of our views, in which the new E.H.T. gear is shown in the distance. The boiler house, in addition to the new boilers, contains seven marine type boilers by Babcock & Wilcox, and Danks.

In recent years the supply of electricity in the borough has developed very rapidly, particularly the power demand, in which connection statistics show that at September 30th, 1911, there was 9,987 H.P. of motors connected to the mains, while at September 30th last, this figure had grown to 21,623 H.P.; moreover, the output generated has more than doubled in five years, and during the last official year's working amounted to 21,064,463 units, of which 18,757,000 units were sold.

In addition to supplying the area of the borough, the Council is giving a bulk supply to the Shoreditch Borough Council, and will, in the near future, be similarly supplying the Bethnal Green Borough Council; at the same time, the reciprocal supply arrangements between the Stepney and Poplar Councils is in operation, and thus a large section of East London will be supplied with electricity from the Limehouse generating station.

In conclusion, we are indebted to Mr. W. C. P. Tapper, the engineer and manager, for assistance in the preparation of this article.

The Russian (1886) Co.—On October 3rd, says a message from Moscow, the Governor of the town, M. V. Chelnokoff, returned from a visit to Petrograd, where he had been to see the President of the Council of Ministers, the Ministers of Trade and Industry, and Finance, and others, on the subject of the liquidation of the Electric (1886) Lighting Co. He submitted an application of the Moscow Town Council to the President of the Council of Ministers, who replied that this question would be carefully considered at one of the early sittings of the Council; but that it was difficult to foresee what the result would be, for in this question financial circles of neutral countries were interested. Most of the shares of the company were in the hands of Swiss banks. The Minister of Trade and Industry appeared chiefly interested in the question of the recent prohibition of the Moscow Council, preventing the company using the current from Bogorod for the requirements of the town. Recognising the town's undoubted right to prohibit the delivery of Bogorod current into the town system, the Minister at the same time considers that the town should take into account the circumstances of the moment, and the general shortage of fuel. English coal is not being received at present. The Dombroff coal fields have been seized by the enemy, and the transport of coal from other fields is difficult. The company serving the town system has to use six wagon loads of petroleum per day; but the transport of the petroleum is difficult, and the price is very high. Meantime the Bogorod station has 11,000,000 poods of turf ready which should be used, because during the winter time it will become moistened and will deteriorate. Thereupon M. Chelnokoff stated that the question of prohibiting the admission of the current was already finally decided by the Town Council, and he was powerless himself to vary the decision. The Minister of Trade agreed with this view of the Governor, and said he would address the Moscow Town Council in a special communication asking it to vary the decree.

THE ELECTRICAL TRADE POSITION IN CHINA.

Mr. W. G. L. Riddle began his address to the Birmingham and District Electric Club on October 23rd by thanking members for their cable, received at Shanghai on New Year's Eve, informing him of his election to the presidential chair. He took as the theme of his address his visit to the Far East. The majority of his time in China was spent in Shanghai, which was the foremost commercial, industrial, and shipping centre of Asia. Shanghai had every cause to be proud of its progress as shown by the marked improvement in, and the gigantic dimensions of, so many of its constructional works, by the completion of its electric tramways system, its electricity supply system, and the various railroads which connected practically all China with Europe. In addition to these, there were the dockyards, shipbuilding, and engineering firms, all of which indicated progress in the right direction. There were 24 different nationalities represented in the one small municipality—the International Settlement. Mr. Riddle went on to refer in particular to the Shanghai electrical undertaking, its peculiar position, and the electrical trade generally in China.

He said that Germans were the greatest competitors in the electrical engineering trade in China. As a matter of fact, they had practically ruined the Far Eastern business by the severe cutting of prices. Subsidised by their Government, and helped by their bankers, they had been in a position to secure many contracts which, in the natural order of things, might have been executed in Britain. Since the outbreak of hostilities, neither Britain nor Germany had been able to take contracts, and, in his opinion, after the war was over Germany would be in the field again with renewed vigour. Before he left China in April last, America and Japan were securing the bulk of the trade, for there was a rapidly growing and almost limitless market, and an equally rapidly growing competition, which would doubtless be augmented by the serious efforts of the Japanese in the very near future. This Eastern nation was already producing very creditable copies of the best European and American practice, and, although their present production was insufficient to allow them to compete with advantage, it was certain that time would amend this, and they would have the advantage of low freights and insurance, and also of quick deliveries. The British merchants in China did not receive the help from the British manufacturers that was desirable to secure their share of the trade. Very few large manufacturers had their own representatives on the spot. The majority of them employed—without any salary—some firm of merchants, and if any help was required by the merchants, the British manufacturer would not give the desired help; hence, the success of the Germans.

Mr. Riddle said that he visited a Chinese city some 1,000 miles from Shanghai (600 miles by steamer and 400 by rail). In that city one was in China proper. There was not such a thing as a European building, and even if one stood in the street for a few seconds a crowd collected. He secured the best room in the best Chinese hotel—save the mark! In this country it would have been termed a shed. Let them picture to themselves a room with a European bedstead, a very small table and washstand, and with a charcoal fire in the centre. This was his abode for a fortnight, but there was a ray of light in this miserable shanty; it was lighted by a metal filament lamp! Current was supplied from sunset to sunrise by the Electric Light Co., who had some of the best machinery that English makers could supply. Such English makers had been paid every penny for their machines, but the merchants who had secured the business had not, hence his visit. In the same city a flour mill had been running for, say, twelve months. This, again, had been supplied by a good British firm; and, although they had been paid for their machinery, the merchants who secured the business had not. In this case the Chinese could not secure the requisite amount of flour which the makers guaranteed, but the merchants received no help from the British manufacturers. They might ask him, what about the future in China for British goods? The answer was beyond him. If ever the time did arrive when British manufacturers were in urgent need of orders—and they might live to see the day—their tactics would have to be changed if they wanted to fight against Continental competition. The British Government might have to help them, but certainly something would have to be done. "For meanness in the furtherance of British trade in the Far East, commend me to the British manufacturers!"

Mr. Riddle proceeded to make some suggestions to British manufacturers who proposed in the future to secure some of the Chinese business. Vast opportunities had been, and were still being, lost owing to the reluctance displayed by manufacturers in appointing engineer representatives in the more important centres of China. Salesmen only were not required. Take a good firm of electrical manufacturers who desired to open out in China: they should send out a smart young man who had been through their shops, and knew their machines, so that when orders were secured and the goods delivered this representative could see that the machines were erected properly, or could advise the Chinese on any technical point necessary. Salesmen who were not engineers only helped to retard British business in the Far East. As an instance of this, he cited the case of one of our largest and most powerful manufacturers of electrical machinery whose representation in the most important industrial and commercial city of Central China was, until recently, entrusted to a firm of general importers who were nothing if not non-technical. Indeed, the city in question was until recently entirely without technical representation of British electrical manufacturers. As against this, it should be noted that the leading German electrical houses supported no less than five responsible advising engineers, and maintained heavy stocks of electrical gear and supplies in that city. He was ready to admit that, having in mind the amount of business done, these firms could have shown little, if any, profit after payment of the heavy overhead charges thus incurred, and it was also reasonable to suppose that the Government subsidies had assisted Continental firms to survive these heavy initial expenditures. In this connection, it would appear that, granted that any Government considered that a venture was worthy of subsidies, it was reasonable to suppose that the said Government was not actuated by philanthropic motives, but rather by a desire to eventually participate in the resultant success of that venture, such participation in this case taking the form of increased export duties and the many other obvious advantages of increased trade. Nevertheless, the fact remained that they had thus introduced a serious element of competition which reacted to the disadvantage of the British manufacturers, and which would, in a great measure, be met by the more liberal introduction of technical representations.

It might be presumptious, or even precocious, on his part to comment upon the apparent policy of British firms seeking Eastern markets, as he had known them. A friend of his in Shanghai (an Englishman) had upon innumerable occasions had to recommend the purchase of electrical gear from Continental houses because of the advantage of their quotations as compared with those of British firms. It might be argued that sacrifice to cost was made at the expense of quality. In reply to this, he would point out that, as his friend was responsible for the subsequent efficient operation of the gear in question, he would obviously err upon the side of recommending quality even at slightly enhanced prices. His friend cited instances almost without limit where British firms had placed goods upon the Eastern market at prices 150 per cent. in advance of their own home quotations, and had expressed sentiments of outraged patriotism when their less ambitious Continental contemporaries secured the contracts. Prospective buyers' positions in China were the same as elsewhere. It was their obvious duty to obtain the best goods at the best price, irrespective of sentiments. Hence the amount of Continental apparatus which was being imported, and hence the wails which emanated from the British importers.

He had recently been told by a British representative that his firm were securing a fair profit, that their home works were fully occupied, and, because of this, they did not feel called upon to cut prices and seriously compete with the Continental houses. This representative spoke in the *present* tense. This appealed to the speaker as being a very typical attitude of British complacency in the face of an impending struggle for very existence.

He took this opportunity of informing the manufacturers that the greater proportion of apparatus exported to the Far Eastern market would be operated by a class of native to whom common-sense, as generally accepted, was an unknown quality; to whom brute force and ignorance were thoroughly understood; and to whom brass or copper in any form was an accepted currency. With this in view, gear should be robust, fool-proof, and without any unsecured brasswork which performed an essential function. He recalled the case of a consignment of excellent one-phase and three-phase motors which were bought for hiring purposes, and were constantly identified with bearing troubles owing to the fact that unsecured brass caps were provided for the oil wells and that brass oil-level indicators were provided. These were at once converted into currency, and the oil became a thing of memory only. Hence the constant annoyance of bearing failures, which were dealt with by the scrapping of the brass and the substitution of iron fittings. Circuit-breakers and other switchgear should also be devoid of brass fittings which did not carry current (and thus their own protection) for similar reasons to those given above. Considerable trouble was experienced owing to the repeated thefts of heavy brass dash-pots from the trip gear of a well-known make of circuit-breaker. In this case the dash-pots could as easily have been incorporated into the casting of the switch and thus have been invisible, and also free from experimental re-setting of the tripping values as carried out by the most inquisitive and information-seeking natives known to man. These, at first sight, might appear to be petty matters, but it would readily be believed that they had an important bearing upon the reputation of the apparatus concerned. Another excellent single-phase motor was supplied with an oil-immersed multi-contact switch controlling the starting operations of cutting out the starting windings and also, by steps, the rotor resistance. Not being provided with a positive "on" and "off" mechanism, it was possible to leave the controller in intermediate positions and thus obtain variable speeds at the expense of efficiency and the ultimate burning out of the rotor resistance, which was not sufficiently liberal in section to carry the rotor current for more than a few minutes. Notwithstanding incessant warnings to consumers, heavy loss and

expenditure were involved in effecting the repairs thus rendered necessary, and that particular maker's reputation suffered in consequence, merely owing to lack of attention to essential practical detail.

Further, it must be borne in mind that in Central and Southern China the atmospheric conditions were extremely severe during four months of each year, when shade temperatures of 106 deg. F. were the rule and humidity was at saturation point. In consequence, the general experience was that a motor able to sustain a 20 per cent. overload during the cool months would quickly attain a dangerous temperature on full load only during the hot season. In view of this, it was advisable to provide efficient draught-inducing devices and liberal core-ventilating arrangements.

Owing to native characteristics, the speaker considered that wound-rotor motors used in conjunction with liquid starters were to be preferred to squirrel-cage machines, notwithstanding the slightly lower cost and higher frequency of the latter type. Given a geared-down slow motion liquid starter one had a robust and fool-proof combination possessing a good starting torque and not requiring skilled manipulation or heavy starting currents. If auto-transformers were utilised in conjunction with squirrel-cage motors, it was essential that they should be fitted with mechanism which did not allow the switch to be left in the starting position, so avoiding the trouble previously mentioned in connection with single-phase motors.

With a view to reducing freight charges, slide rails could be cheaply cast by native firms in China to standard patterns. The common practice of supplying motors with pulleys already fitted was to be deprecated, inasmuch that driven shaft speeds were a variable quantity, and, the motor pulley being generally smaller than the shaft pulley, it was better economy to effect the necessary changes to this rather than to the larger and more expensive shaft pulley. Finally, he urged upon manufacturers the desirability of duplicating name-plates and all plates giving information relative to capacity, voltage, etc., in Chinese characters, both for the purpose of ensuring proper use of the apparatus and also with a view to the advertisement gained by familiarising their names to users of their gear. A trade mark, or "chop" as it was known, carried a great deal of weight in China.

DIESEL ENGINE USERS' ASSOCIATION.

Lubrication of Diesel Engines.

The October meeting of the Association was held recently at the Institution of Electrical Engineers; several engineers having control of Diesel engine plants in Great Britain and abroad were elected members of the Association, and the membership now includes engineers connected with Diesel plants in such distant parts at Oudtshoorn (South Africa), Normanby (New Zealand), Delhi, and Colombo.

After reporting the progress made with the scheme for insurance at Lloyds against breakdown of Diesel engines, and in connection with the Association's efforts to obtain better terms from the Inland Revenue authorities for a reduction in regard to depreciation on the assessment of Diesel engine plant for income-tax, the discussion on the question of lubrication of Diesel engines was resumed.

Mr. C. O. Milton (Maidenhead) observed that much benefit had already accrued to several of the Diesel engine installations as a result of the circulation of data and particulars furnished by members of the Association. A careful consideration of the results obtained on various plants seemed to show that the consumption of lubricating oil on any particular engine was practically independent of the load at which it worked. He admitted that the consumption of lubricating oil must necessarily be somewhat higher when the engine was working on a heavier load, and, consequently, at a higher temperature; but his point was that the lubrication arrangements had to be generally set slightly on the liberal side, so as to suffice for such times as the engine might be called upon to do a heavy load, and that the increase in consumption of oil at the heavier load was comparatively negligible. He, therefore, arrived at the conclusion that a reasonable basis for comparison in the consumption of lubricating oil on various Diesel engine plants might be obtained by working this out in figures of gallons per B.H.P., per hour, taking for this purpose the maximum B.H.P. of which an engine was capable. Tests on the consumption of lubricating oil, to be of any value, must necessarily be taken over a long period of actual working, and in this connection he referred to the great importance of adopting the best means of filtering or treating the oil recovered for re-use.

Mr. P. H. Smith, who had been invited to attend the meeting, also laid stress on the great importance of dealing with the used oil by the best method, and considered that the low lubricating costs which had been arrived at on certain Diesel engine installations were to be attributed chiefly to the adoption of good methods of treating the oil.

Mr. R. W. Lyle (Hoffmann Manufacturing Co.) was of opinion that the filtered oil should be allowed to stand for some considerable time before being taken for re-use, and that as a rule about 10 per cent. of new oil should be added to vivify it. The necessity of keeping a good body in the oil was of importance to prevent undue wear and tear on the bearings. He discussed the varying practice on different installations in connection with the removal of the carbon deposit from the top of the piston and from the rings, as affecting the question of efficient lubrication of the cylinder.

Mr. G. Porter (Worthing) gave some figures of comparative tests which he had had carried out on new oil and on oil after use in his Diesel engines, and filtered or treated, which showed that the deterioration in its quality after a considerable amount of use was not very appreciable.

In the further discussion which followed it was generally agreed that the feeding of the lubricating oil to a Diesel engine could not in practice be regulated in accordance with the variations in load.

Mr. C. Gould (Letchworth) stated that he found that the consumption or destruction of oil increased considerably after the engine had been running for a long continuous period.

Mr. Dixon's experience (Leatherhead) showed that the worn condition of liners resulted in a very definite increase in the consumption of lubricating oil, as well as in that of the fuel oil.

The next meeting of the Association will be held on November 24th, when the subject of "Cracked Pistons" is to be further discussed. Information and particulars concerning the Association can be obtained from the Acting Hon. Secretary, Mr. Percy Still, 19, Cadogan Gardens, London, S.W.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

British Manufacturers Criticised.

I feel in penning the following that I am echoing the opinion of many other traders in the Colonies.

During these times one is frequently reminded of his duty to his King and country by the many resolutions passed by Chambers of Commerce, Trade Associations, Societies and others, hence the feeling of patriotism goes without saying; nevertheless, upon afterthought and experience one is reminded of the sacrifice incurred by so doing.

To mention our own experience, which is the rule rather than the exception, will give English manufacturers, the British Government, and others an idea of how we have to strain occasionally to make ends meet.

One of our principals has for some time been asking us to push for business in his line, and after strenuous efforts we succeeded in pulling off some orders, which were, in due course, forwarded, but although nine months have elapsed the goods have not yet been shipped!

Another of our principals, for whom we have worked hard and succeeded in securing some thousands of pounds' worth of trade, up to a week or two ago was requesting orders, and now informs us that not one of them has been dispatched, although some are six months in hand!

Over 16 months ago we placed a 12 months' contract with another manufacturer, who is still seeking trade, but who has, so far, only shipped one small consignment.

Yet another took our order for plant in October last year for delivery f.o.b. London within 12 weeks, and the plant has not left the works to date—and I might give many other instances.

Now munitions and other pressing work which must take first place probably interferes with factories, but why should we be asked for orders when there is apparently not the slightest chance of their being executed? We have two hundred and sixty-four (264) orders which have been over six months in British manufacturers' hands and are not yet dispatched, which is beyond a joke.

One firm who have had several orders from us for an important part of the installations of six different plants, which will be unable to give light and power to their many clients, have just informed us, although the orders have been in many cases many months in hand, and they are still quoting for business, that the materials for our orders have been acquired for munitions and cannot be dispatched, and as we cannot purchase elsewhere, and have deposited some hundreds of pounds as security for due fulfilment of contracts, and many other sub-contractors have probably done the same, one can imagine how far-reaching will be the effects.

Penalties are likely to be enforced—in fact, in almost all cases are threatened—such as forfeiture of deposit, or buying in against us and charging us with the difference in price, which is invariably higher.

If substitutes cannot be got for our material, the other sub-contractors for the balance of the plant cannot get their test and maintenance certificates and progress payments, and almost everybody concerned is much inconvenienced and out of pocket—possibly *except* the British manufacturer.

The loss of prestige, interest, profit and trade by the Colonial house is no small item, and as a result of this, in order to exist the concern has to find another market, hence the gain of such countries as America and Japan, &c., as is evidenced by the enormous influx of U.S.A. motor-cars into England, Australia and elsewhere, because of the inability of the British manufacturer to supply.

We have the consolation, however, that we have done our duty to the Mother Country, and hope that the goods we have lost have accounted for more of the enemy.

We are afraid that when the war is over it will be a tough proposition to dislodge the foreign trade, which, unfortunately, in many lines is fast getting a hold in British lands.

We think that if British manufacturers were to look at it from our point of view a little more, and not seek and accept business that they cannot hope to carry out, and were to release us for the time being from agreements, they would earn the appreciation of their representatives, who have to earn a living as best they can just now, and do not wish to make their lot any more difficult by any means.

I am, however, sure that it is the wish of all importers to support British industries, and that they will to the best of their ability keep trade within the Empire, but, at the same time, they desire reciprocity.

Æquo animo.

Australia, *September 8th*, 1915

The A.E.G. Meeting.

I have read with much interest the recent correspondence in regard to the Electrical Co., Ltd., of Charing Cross Road, which is, of course, nothing more or less than a branch house of the A.E.G., of Berlin. I am amazed at the apathy with which the matter is generally regarded, alike by the electrical trade in general and the otherwise excellent technical Press which represents it. I allude, of course, to the whole question of German trading houses, but the case of the Electrical Co., Ltd., will serve as a good example.

The apparent apathy of the trade can no doubt be better understood when it is remembered that nearly all the larger or important manufacturing concerns are "tainted" in a greater or less degree by German influence in some shape or form, so that although many of them would wish to enter the lists and voice their British and patriotic views, the "subtle influence" warns them to "go slow," and they must perforce remain silent.

The technical Press cannot be said to be "tainted" in the same manner as the trading part of the profession, but, nevertheless, the "subtle influence" is there all the same, and it warns the editor to be careful not to take too outspoken a view of the matter, but content himself with exercising a benevolent neutrality. He, therefore, confines himself to allowing those patriotic readers who choose to have full run of his "Correspondence" columns.

The correspondence, which started in a most promising form, has practically fizzled out, whereas a sympathetic leading article or two from your pen would have encouraged the opening-up of the whole subject, with the result that the electrical trade and profession would have been able to gauge the danger. That there is a real danger ahead I am convinced, and this quite apart from the patriotic or sentimental side of the question.

It is not too late to tackle the problem in earnest. Let us consider what is going to happen in the most favourable circumstances.

At the successful conclusion of the war, Germany will, from a manufacturing point of view, be very much in the position she was, say, 25 years ago, the only difference being that from the point of view of machinery and labour she will be very much up-to-date. Labour will be at a very minimum of cost, and in order to make up leeway the manufacturer will be prepared to make great sacrifices. Dumping will commence in earnest, and with our labour market as it is, and undoubtedly will be, every circumstance will be favourable.

Such concerns as the Electrical Co. will act as admirable distributing centres, and having been kept "warm" will be able to commence operations without any preliminary troubles. It will be too much to expect the purchasing section of the industry to resist the cheap prices. With a few notable exceptions, electrical contractors are without backbone, and they have so little independence that they will readily succumb. As to Municipal Electrical Committees, the case with them is already such a scandal that it does not need any labouring on my part.

The matter is one which should, at the outset, have been tackled by the technical Press as a whole in connection with the various Institutions, trade associations, &c. I am surprised that a matter so vitally affecting the B.E.A.M.A. and the E.C.A. should have been regarded by them with so much apathy. I am, however, informed that it is as much as either's existence is worth to interfere with or tackle the subject. If my informant is correct, the inference is obvious. At what a pass has the industry arrived! To expect the assistance or co-operation of the Institution in such a purely trade matter would be obviously childish.

As to the staffs who are running these concerns, it is difficult to believe they are British. Let them read of Edith Cavell, and thank Heaven they are serving such masters. If they think that they are saving up a good job for themselves, let them not be deceived. Their German masters, on their return, knowing that these pariahs will never get a decent job in any respectable firm, will take advantage, and their treatment of them will be a satisfactory punishment. For the present they should be regarded as outcasts, and should be expelled from any society they may be members of, and generally ostracised.

I would also warn the purchasing section of your readers against the neutral game which is now being played so generally. Only a fraction of the goods reputed to be of the particular neutral country could possibly have been made in that country. This is common knowledge in the particular neutral countries from which the goods come. These remarks apply to every neutral country that is sending us goods. There is a simple method by which the buyer can satisfy himself as to the genuineness of the country of origin. He should insist in every case that a descriptive invoice be furnished with the goods, stating explicitly that the manufacturer and the seller both guarantee that every portion of the article, whether in a finished or raw state, emanates from his country or some other neutral or friendly country, and that he guarantees that no part, finished or raw, emanates from an enemy country. If there be any hesitation on the part of the manufacturer or seller to give this guarantee, then the buyer may be fairly certain that the goods are of questionable origin.

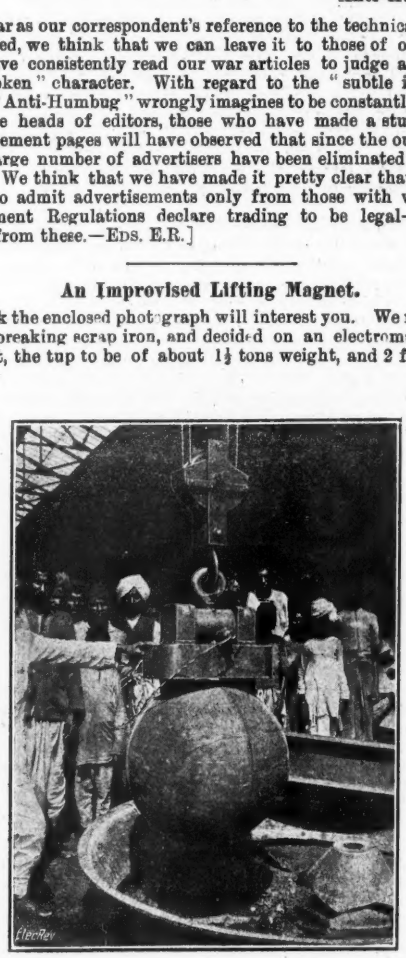
I may very properly conclude this letter by remarking that I, personally, have no axe to grind. I am not interested from a personal point of view whether the enemy sends electrical goods to this country or not, now or hereafter. I neither buy German goods, nor is there any necessity for my selling to them, and from the commercial point of view I am quite unaffected.

Anti-Humbug.

[So far as our correspondent's reference to the technical Press is concerned, we think that we can leave it to those of our readers who have consistently read our war articles to judge as to their "outspoken" character. With regard to the "subtle influence" which "Anti-Humbug" wrongly imagines to be constantly hanging over the heads of editors, those who have made a study of our advertisement pages will have observed that since the outbreak of war a large number of advertisers have been eliminated from our pages. We think that we have made it pretty clear that it is our policy to admit advertisements only from those with whom the Government Regulations declare trading to be legal—and not always from these.—Eds. E.R.]

An Improvised Lifting Magnet.

I think the enclosed photograph will interest you. We required a tup for breaking scrap iron, and decided on an electromagnet for lifting it, the tup to be of about 1½ tons weight, and 2 ft. 6 in. in



diameter. The magnet consists of a piece cut from a scrap crank-shaft, the pole faces being turned hollow spherical to embrace the ball. The pole section is about 32 sq. in.; the magnet is supplied with 6½ amperes, D.C., at 110 volts.

P. H. Browne.

H.H. The Nizam's Mint,
Hyderabad, *September 30th*, 1915.

The Institution and Alien Enemy Members.

I regret that I have to ask your indulgence to insert a further letter in connection with the exclusion of all alien enemies (naturalised or not) from the Institution of Electrical Engineers, but having heard that there is a likelihood of members not wishing to notify the Secretary that they are in accord with such exclusion, having regard to the fact that it might be prejudicial to their business, I now solicit the help of your paper to get assistance from all Associations numbering amongst their members those of the Institution to pass resolutions to this effect, which I understand has been done already by one or two such bodies. I also ask that the hon. secretaries of the Local Sections (both at home and abroad), will formally pass resolutions to this effect.

I think the time has arisen when the Institution should not fail to take the lead given it by the Iron and Steel Institute, a body quite worthy of being followed in this respect.

I trust those members who have not yet sent in their names to the Secretary will do so, or, failing that, show their approval by refraining to attend any meetings of the Institution, either in London or at the Local Sections, until this policy has been adopted.

Station Engineer.

October 25th, 1915.

I notice in your issue of October 15th a letter from "Station Engineer" respecting the exclusion of all members of the Institution of Electrical Engineers of enemy origin (whether naturalised or not).

If we are believers in keeping to our obligations, and in not treating these in the manner the Germans do, we should certainly honour "scraps of paper" in the form of naturalisation papers, especially when these have been preceded by the denationalisation of the individual in his native country.

Moreover, apart from the question of honour, surely those naturalised British subjects, whose social and business interests are bound up in this country, are entitled to be treated as ourselves, as, from a materialistic point of view, they must surely work with us in the interests of this country, and must, therefore, be "for us." In any event, it savours too much of German methods to suggest expelling *all* members of enemy origin, irrespective of their pre-war history.

I have in mind a man with whom I have been associated for years—of enemy birth—who was known for years before the war for his anti-German views, whose ideals are, and have been, British for 25 or 30 years, whose every penny is in this country, whose children hardly speak a word of German, whose honour I can vouch for; and yet such a man, because of the accident of his birth, must be hounded out of our institutions, &c.

If, however, the majority of the members of the Institution should decide for some action, at least let them arrange that each case shall be treated on its merits.

October 26th, 1915. **A.M.I.E.E.**

Electric Heating.

Now that electric heating is becoming more and more universal throughout the country, one is surprised to find a supply authority going out of its way to retard the progress of the above, which to us electrical engineers can be proved to be a remunerative load. The effects of this policy must be felt by the local contractors, and by the wholesale suppliers and manufacturers, with the result that it is almost impossible to canvass and educate the consumers to the uses and superiority of electricity as a domestic asset.

The writer himself is convinced, now that coal is at such a high price, and the gas authorities intend to raise their prices still more per 1,000 cubic feet to the consumers, that electricity even at 2d. per unit, can make it worth while for the ordinary consumer to install an electric fire. In Chiswick the consumer is not encouraged to lay out any money, on what some people call necessities, in fact assets to supply authorities. We are supposed to be poor men, afraid to spend half a crown, yet the writer has willingly spent a few half crowns, knowing that he will save a certain amount, that will repay his outlay.

Perhaps others readers will help to take this matter up, and ensure a sufficient co-operation between consumer and supplier; so that other consumers will be able to save their half crowns, and indirectly promote the business interests between manufacturer and contractor, as well as between the contractor and the consumer.

I give the above information for what it is worth, and have much pleasure in enclosing my card.

Wholesale Supplier.

October 26th, 1915.

LEGAL.

Dealings in Marconi Shares.

The hearing of the plaintiff's appeal in Sagar *v.* Isaacs was continued, and on Friday last Mr. Leslie Scott, K.C., brought to a close his arguments, which had lasted nearly four days. He contended that the agreement set up by the plaintiff was a perfectly proper compromise.

Mr. Greer, K.C., opening the case for Mr. Isaacs, submitted that the case put forward for the plaintiff was a perfectly impossible one. The more possible view was that there was no agreement at all, but, if any agreement was entered into, it was more from threats in the nature of blackmail. In either case, judgment was properly entered for the defendant, but he asked the Court to find that the blackmailing was unsuccessful, and that the contract was never made.

At the conclusion of the arguments, which had extended over seven days, their Lordships on October 26th reserved judgment.

Harrison *v.* Ottley and Others.

A settlement was announced in Mr. Justice Darling's Court, in the King's Bench Division, on Monday, in this special jury case, relating to an agreement for the purchase of a secret process for the manufacture of metallic filaments for electric lamps.

When an application in the case was made recently, it was stated that Mr. Harrison was suing Sir John Ottley and the other defendants for alleged breach of agreement, and that their principal defence was an allegation that the plaintiff had not properly disclosed the process for the purpose of a test.

Counsel now announced that the case had been settled on terms that would be endorsed on their briefs, with a Judge's order, if necessary.

BUSINESS NOTES.

Catalogues and Lists.—Messrs. L. Andrew & Co., Manchester.—Price leaflet of "Wrendal" metallic-filament lamps and "Capella" carbon-filament lamps.

Edison & Swan United Electric Light Co., Ltd., Ponder's End.—Ten-page illustrated list, giving particulars and prices of a variety of accessories for electric light fittings, including ball fittings, cord grips, caps, ceiling plates, carriers, glass holders, cord shorteners, window brackets, &c.

Messrs. Baxendale & Co., Ltd., Miller Street, Manchester.—List No. 51,016 contains illustrated descriptive matter and prices of electric grillers and toasters, electric cookers, various electric ovens, kettles, food-warmers, electric fires, and other cooking and heating apparatus.

The Jackson Electric Stove Co., Ltd, 38, Blandford Street, London, W.—Sixteen-page pocket pamphlet, giving very full particulars of the Jackson electric fires. The closing pages contain illustrations of a few types and a note of prices. A separate folder tells the reader "How to Solve a Domestic Problem," and why the electric is superior to the gas or coal fire.

The Titan Packing Co., Dunstable.—Priced circular respecting their compressed jointing, "Titanite."

Osram Painting Books.—Originality in advertising is a rare quality, and it is exceptionally difficult to attain in connection with an article so long and so variously advertised as the electric lamp. But the General Electric Co., Ltd., of 67, Queen Victoria Street, London, E.C., has tapped a really novel source of interest in a series of children's painting books. Each of three books has, on the left-hand pages, a coloured drawing, and on the corresponding right-hand pages the same drawing in outline. The pictures illustrate rhymes which, in simple fashion, sing the virtues of Osram lamps. The drawings have a quaintness which will appeal to the children who are set to enjoy the pleasant task of colouring them, while both they and their parents will receive a happy impression of the Osram lamp. These painting books are being distributed among electric light consumers, and have already proved very popular.

Book Notices.—*Analyst and Client.*—By C. H. and N. D. Ridsdale. Middlesbrough: Ridsdale & Co. Price 6s.—This is a collection of notes on chemical and physical testing for the use of works managers, engineers, &c., and is, we should think, unique in form and substance. Its aim is to assist analysts and their clients to understand each other better, and to help the latter to utilise the information obtainable from the former. It is divided into three sections, dealing respectively with questions affecting all public analysts, questions affecting analysts who are technical specialists, and the testing of electrical conductor rails. Numerous tables are provided, with forms for recording analyses, sample analyses of known brands of materials, &c., as well as much information for the guidance of the client. We are mainly concerned with the third section, in which for the first time, we believe, a quantity of data has been accumulated relating to the quality, &c., of steel conductor rails, a matter which has become of considerable importance and will increase in importance. This section comprises 10 tables, giving the resistances of rails expressed as "times copper," and in terms of ohms, also resistance conversion tables for weight and volume measurements, temperature effects, reciprocals, areas, variations of density, &c. The amount of information that has been brought together in connection with what at first sight appears to be a subject of limited possibilities is quite surprising, and we should think that the book will prove very useful to engineers and others interested in the electrification of railways.

"Rubber Machinery." By H. C. Pearson, editor of the *India-Rubber World*. New York: *India-Rubber World*. Price (in U.S.A.) $6, post free.

"The Practical Design of Steel-Framed Sheds." By Albert S. Spencer. London: Constable & Co. Price 10s. 6d. net.

Proceedings of the American Institute of Electrical Engineers. Vol. XXXIV, Part 10. October, 1915. New York: The Institute. Price $1.00.

Bankruptcy Proceedings. — J. Taylor Peddie, mechanical engineer, London.—The public examination of this bankrupt took place on October 22nd. According to the *Times* report, debtor stated, in reply to the Assistant Official Receiver, that he was born in Canada, was an expert rifle shot, patented a wind-gauge rifle sight, formed in 1903 the Peddie Small Arms Corporation, Ltd., was departmental manager to the B.S.A. Co., Ltd., and in recent years had turned his attention to obtaining a controlling interest in the Consolidated Diesel Engine Manufacturers, Ltd., against which a compulsory winding-up order was made in 1914, debtor losing £2,700. He was a writer on economic subjects, a Fellow of the Statistical Society, and was now interested, with others, in the formation of the Institute of Industry of Great Britain and Ireland, Ltd. He ascribed his failure to speculations on the Stock Exchange and to loss in the Diesel Co. The examination was concluded, the debtor estimating his liabilities at £8,775, against assets, nil.

Herbert Page (Smeeton & Page), electrical engineer, London, E.C.—November 6th is the last day for the receipt of proofs for intended dividend by the trustee, Mr. E. S. Grey, Bankruptcy Buildings, Carey Street, W.C.

Arthur Faraday Hawdon, electrical engineer, of Gosforth, Northumberland.—At Newcastle-on-Tyne Bankruptcy Court on October 21st this examination was closed.

Trade Announcement. — Messrs. Cave & Higgin, Ltd., agents in Lancashire and Cheshire for Pirelli's cables and for the Midland Electric Manufacturing Co., Ltd., state that Mr. C. A. Cave, formerly director and secretary of their company, is not now connected with them, all his interest in the concern having been acquired by the remaining directors. The company will shortly be removing into larger premises; meanwhile all communications should be addressed to 23, Hardman Street, Deansgate, Manchester.

Liquidation. — Meldrum Bros., Ltd., Timperley.—Liquidator (Mr. T. Gregory), released August 25th, 1915.

Aerial Wire Ropeways.—Messrs. R. White & Sons, of Widnes, have just executed a smart piece of work for the War Office. They received an order for two of their aerial wire ropeways for the use of the troops, and, as the matter was urgent, they succeeded in getting the whole of the two ropeways dispatched within three weeks of the receipt of the order, complete with all the driving gear, engines, carriers, &c.

South African Electrical Imports.—The imports of electrical material into South Africa during last year only attained a value of £874,627, as contrasted with £983,624 in 1913.

LIGHTING AND POWER NOTES.

Accrington.—Sewage Pumping.—An application from the Accrington and Church Joint Outfall Sewerage Board for a supply of electricity for power purposes has been granted on the understanding that the Board pays the cost of laying the service cable from the main.

Certain employés in the electricity department have made application for increased wages, and it has been decided to give them an extra ½d. per hour, with time and a half for Saturday overtime, and double time for Sunday overtime.

Argentina.—An electric power station is shortly to be installed in the town of Dehesa (Province of Cordoba).

The Supreme Court of the Nation has given judgment in the action brought by the Compania Alemana Transatlantica de Electricidad against the municipality of Moron. The municipality declared null and void a contract made with the company in 1906 for the supply of public lighting for a term of 20 years. The company then brought an action before the Supreme Court of the Province, which decided in its favour, declaring the concession valid. The municipality appealed to the Supreme Court of the Nation, which has confirmed the judgment of the Provincial Supreme Court.

The Provincial Government of Buenos Ayres has the intention to establish an electrical power house at La Plata, the principal object of which will be to supply light to Government offices, which, under present conditions, pay about $96,000 per annum for this service.—*Review of the River Plate.*

Banbridge.—E.L. Proposal.—The D.C. has requested Messrs. R. J. Hale & Co. to submit plans and particulars of their proposals for supplying electric light to residents in the district from their electric lighting plant, to the town surveyor for his approval. If the surveyor reports favourably the matter will be submitted to the Law Committee for consideration.—*Irish Builder.*

Barnsley.—Prov. Order.—The R.D.C. has agreed to support the application of the Electrical Distribution of Yorkshire for a prov. order.

Bawnboy (Co. Cavan).—Street Lighting.—The D.C. has accepted the tender of the Ballyconnell Electric Light Co. to light the town by electricity.

Bexhill.—Price Increase. — The Corporation has decided to increase the charges for electricity by 10 per cent. owing to the increased cost of coal.

Blackpool.—Free electric current is to be supplied by the Corporation for the Y.M.C.A. hut at the Lancashire Hospital, Clifton Park.

Bradford.—Committee's Report.—A recent report by the Electricity Committee on the work of the department during the year, shows that the war has temporarily reduced the rate of progress of the past few years, the increase of output being only some 739,628 units over the previous year. The total output sold was 28,743,718 units, which included 7,549,223 units, bulk supply for power, &c., 5,612,245 units private power and heating, and 11,400,000 units for traction purposes. There were 2,378 motors, of 11,086 H.P. on general supply, and 537 motors of 6,924 H.P. on bulk supply. The success of the rateable value tariff for supply to domestic consumers is referred to:—807, or 60·5 per cent. (as against 56·5 per cent. in 1914) of domestic consumers were charged on this tariff, and took 797,303 units, or 988 per consumer (as against 613,807 units, or 970 per consumer, in 1914). The generating plant capacity was 15,890 KW., and the maximum load 11,745 KW. The year's income was £147 584, an increase of £3,672 on 1914, and the net profit, £18 956, was the largest yet recorded, due in part to the adoption of the principle of accumulating sinking funds in connection with various Corporation undertakings, which resulted in reducing the percentage to capital of this contribution. Of the year's profits, £5,000 went to relief of rates, £6 910 was expended on capital works, £114 applied to meter depreciation, and £9,437 transferred to depreciation and renewals.

Owing to restriction of borrowing, the anticipated extensions to plant, &c., have been much curtailed. At Valley Road works, an induced draught plant has been brought into use with satisfactory results. The two cooling towers in the extension scheme are both in use, also a new storage battery. The new 5,000-KW. turbo-generator has undergone preliminary trials, and two 1,500-KW. rotary converters are practically completed.

As a result of improvements, it has been found possible to run the Sunbridge Road, Odsal and Thornbury sub-stations in parallel with the Valley Road generating works, on the direct-current as well as the alternating-current side, with resulting greater economy and improvement in the traction supply; 35 E.H.T. transformer chambers are now in commission, with two others nearing completion, and 52 6,000/400-volt three-phase transformers of 7,859 K.V.A. capacity are in use in them. Bulk supply agreements were concluded for 2,900 KW. during the year, and the total number of consumers at March 31st last was 4 510.

While the Committee looks forward with confidence to the future, it recognises that working costs and financial charges and rates will be higher during the present year, and the financial result is not expected to equal that of last year.

Canada.—Several private concerns have offered to supply electricity in bulk to the municipality of Edmonton, and an offer from the Edmonton Hydro-Electric Power Co. has been favourably received by the City Council. The company proposes to erect generating plant on the River Saskatchewan, and to construct an electric railway along the route of the power transmission line. The capital outlay contemplated is £1,200,000. The promoters include Sir John Jackson & Co., of London.

Cheadle and Gatley.—Proposed E.L.—The U.D.C. has decided to ask the Corporations of Manchester and Stockport for their terms for providing a supply of electricity to the district.

Chesterfield.—Price Increase.—The local Chamber of Trade has asked the T.C. to re-consider the decision to advance the price of current to small consumers for lighting by 12½ per cent.

Clones.—Price Increase.—The Electric Light and Power Co. has increased the price of current from 5d. to 6d. per unit.

Coventry.—Proposed Extension.—The Daimler Co. has informed the T.C. that in the near future it will probably require a further supply of current for power beyond that for which it has already applied. In order to accede to the application, further extensions will be necessary at an estimated cost of about £30,000. The Council has decided to ascertain from the Government whether, in the event of further extensions being carried out, it will make a similar financial arrangement to that made in respect of the extensions now in progress.

Darcy Lever.—Street Lighting.—The Council has adopted electricity for lighting Long Lane to Darcy Lever. The installation is automatically controlled by means of an electric time switch.

Darlington.—Proposed Loan.—The Corporation Electricity Committee, on October 22nd, decided to apply to the L.G.B. for a loan to cover the cost of a 3,000-KW. set.

Eccles.—Correspondence has taken place between the town clerk and the Minister of Munitions respecting war service badges and the prohibition of the employment of men employed at the electricity works, by others, without the consent of the Corporation, and these matters, together with the question of the expediency of applying for the electricity works to be deemed a "controlled establishment," have been referred to a Sub-Committee.

Fakenham.—E.L. Scheme.—The Walsingham R.D.C. has received a communication from Mr. Best, of Bradford, relative to the formation of a company to provide an E.L. scheme for Fakenham, and desiring to be informed as to the probable attitude of the Council towards the project. It was decided to refer Mr. Best to the Fakenham Parish Council.

Glossop.—Street Lighting.—The T.C. has accepted the offer of the Urban Electric Supply Co. for public lighting, at £1 18s. per lamp per annum, on condition that the lamps were not lighted for more than 600 hours in 12 months, and a charge of 1s., plus 10 per cent., for each additional hour over and above the 600 hours per annum during which the whole 45 lamps were lighted. The contract is for a period of two years.

Hornsey.—The T.C. has accepted a recommendation of the Electricity Committee that in certain cases of current to be used for manufacturing purposes, a special two-rate system should be adopted on the basis of 1d. per unit, for use during daylight, and 2½d. per unit after daylight, subject in every case to the borough electrical engineer being able to make suitable arrangements as to load, payment for special meter, &c.

Hull.—Price Increase.—The Electricity Committee has decided, owing to the increased cost of materials, to raise the price of current in proportion to the said increase.

Greenock.—Year's Working.—The annual report of Mr. F. H. Whysall, the borough electrical engineer, for the year ended June 30th, shows that the total income was £62,705, as against £51,358 in 1913-14; the gross profit £32,117 equalled 10·2 per cent. on the average capital, and after deducting interest £9,298, sinking fund £9,980, and depreciation £2,442, the net surplus was £10 397, as against £3,463 in the previous year. The total units sold were 14,207,575 as compared with 11,451,483 in 1913-14, or 24 per cent. increase, being 14 per cent. from Greenock and 10 per cent. from Port Glasgow, for the first eight months' supply. Of the total, 10,339,151 units were sold for power purposes in Greenock, and 1,148,896 units for power in Port Glasgow. The total connected load amounted to 16,093 KW., exclusive of tramways, and the maximum load to 6,042 KW.; the generating plant capacity was 11,900 KW., and the load factor 26·8 per cent., as against 24·6 per cent. in the previous year. The new 5,000-KW. turbine set has been almost continuously used during the year, and work on the second 5,000-KW. set is well advanced; an additional chimney has been brought into use, and a new economiser is being completed. The generating cost averaged ·372d. per unit; and with distribution amounted to ·411d., while total costs were ·520d. per unit., as compared with ·613d. in the previous year. On the output sold the saving of ·072d. per unit in generating costs represents £4,262. The converting plant at Messrs. Scott's works will shortly amount to 3,150 KW., while another factory will have 1,000 KW. of transformers; the four rotary sub-stations at Port Glasgow have a total capacity of 4,000 KW. The installation department supplied 297 KW. of apparatus, mainly radiators, cookers, irons, &c., during the year. A total of 894 motors, of 11,773 H.P. is now connected to the mains.

Irish Water-Power Scheme.—The Limerick Fishery Board has considered the probable effect of the proposed Shannon water-power scheme on the fisheries of the river. It was stated that the syndicate proposes to construct a tunnel from Lough Derg with the power house at Clontara, near Limerick City; for five or six months of the year the company would require the full flow of the Shannon, and more than the full flow if 10,000 H.P. was generated, and if the project was carried through, it would seriously affect that portion of the Shannon between Limerick and Killaloe. It was decided to communicate with the Irish Board of Works and the Department of Agriculture on the subject.—*Irish Times.*

Latchford. — Church Lighting. — At the Chester Consistory Court last week a faculty was granted for the removal of the gas standards at St. James' Church, Latchford, and for the introduction of an electric lighting installation. It was stated that the church had not a lofty roof, and that the use of gas rendered the atmosphere very oppressive. The Chancellor said the substitution would be a great improvement.

Liverpool.—At the final meeting of the Tramways Power and Lighting Committee, the progress of the electricity undertaking was reviewed by the chairman, who stated that the capital expenditure up to the end of 1914 amounted to close upon 2½ millions, and the revenue for the year 1914 was more than £300,000, while the increased revenue for the six months ending June was about £8 000 over that of the corresponding period of last year. The profits of the undertaking since its purchase in 1896 by the Corporation have permitted £862,128 to be set aside for repayment of capital, a further sum of £390,000 had been placed to reserve, depreciation, and other contingencies, and £285 000 allotted to the relief of the rates. The contribution under this head for the current year was £25,000; there were about 11,500 consumers connected as compared with 10,800 in 1914. During the year 1914 over 48,000,000 units of electricity were supplied for lighting and power purposes, and during the first eight months of this year an increased output of over 3,000,000 units had been supplied, *i.e.*, an increase of about 11 per cent. During the year close on 6 000 H.P. of motors had been connected, and to assist small power users motors were supplied on the hire-purchase system, while to encourage the use of electrical energy for domestic and other purposes suitable apparatus for heating and cooking was supplied on the same system. The demand for electric ovens, radiators and other heating apparatus had considerably developed during the past 12 months.

London.—L.C.C.—The Finance Committee recommends the sanction of the borrowing by the Poplar B.C. of £3,688 for electricity mains.

Hammersmith.—Owing to the extraordinary demand for energy by factories in the Hythe Road area, a comprehensive scheme for supply in that direction has been submitted, and it is proposed to accept a tender of Messrs. Callender for 1,350 yards of cable required.

St. Pancras.—The wages of the stokers at the B.C.'s electricity works are to be increased from 5s. 3d. to 6s. per full shift of eight hours.

Lymington. — Street Lighting. — The T.C. has accepted the offer of the Electricity Co. for lighting river lamps at 4d. per unit, with market prices for renewal of lamps.

Maidstone.—Annual Report.—The report of Mr. E. E. Hoadley, borough electrical engineer, on the past year's working of the electricity undertaking, mentions that the net surplus, £1,553, was the largest yet earned. With the outbreak of war, much difficulty and expense arose in regard to coal supply, but, on the other hand, three small sets were sold for telegraphic purposes, and it was possible to arrange for the installation of a 1,250-KW. Ljungstrom turbine set, with rotary converter and switchgear, which, it is hoped, may be running by Christmass, with resulting economy in working. The output generated during the year was 3,595,584 units, and the output sold, 2,887,857 units; the maximum load was 1,221 KW. lighting, 100 KW. traction, and 76 KW. public lighting. Power units form more than half the total output, and have increased 31 per cent. on last year's figures. The average total cost per unit sold was ·836d., and, including capital charges, 1·36d.

New Zealand.—The Napier B.C. proposes to expend £18,000 in extensions of electric lighting and power plant at the power house.—*B. of T. Journal.*

Oldham.—At the request of the Electricity Committee, whose cables are overloaded in the district, the Tramways Committee has acceded to an application from Messrs. J. Spencer & Co., Hallins Road, for a supply of electricity, the supply to be given from the tramway cables.

Pembroke (Co. Dublin).—New Plant.—The Council has had under consideration the question of the electricity supply for the lighting of the township. It was stated that the Diesel engine had not been in working order for some time, and that whilst the claim was being pressed against the contractors, there was a possibility of a failure in the electric light supply. It was eventually decided that, subject to advice of senior counsel, a new engine be purchased, at a cost not exceeding £2,000.—*Irish Builder.*

Rawtenstall.—It has been reported to the T.C. that, owing to the increased demand for electricity for power purposes, it would be necessary to increase the output of the generating station in the near future. The past half-year had been a very successful period.

Salford.—Loan Application.—Application is to be made to the L.G.B. for sanction to the borrowing of £734, to cover capital expenditure in connection with the electricity undertaking from September 12th to November 12th, 1915, in respect of loans sanctioned by the Board prior to March 12th, 1915. Application is also to be made to the L.G.B. for sanction to borrow £900, to cover the cost of affording a supply of energy to the works of Isaac Bury, Ltd.

Sutton.—Assessment Rate.—In order to encourage the use of electrical heating, the South Metropolitan Electric Tramways and Lighting Co. has introduced an assessment rate, a reasonable number of units being allowed (and presumably used for lighting) at 5½d. per unit, while all excess units will be charged at 1½d. per unit, for any purpose. This arrangement obviates the necessity for special wiring and meters for heating supply, and undoubtedly simplifies the electrical heating problem.

Warrington. — Electrically-Operated Bridge.—The new bridge at Sankey, which crosses the canal, was officially tested and opened last week. The bridge, which is for vehicular and passenger traffic, is raised and lowered by electricity.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—P.A.Y.E. System.—The T.C. has received a letter from the International P.A.Y.E. Tramcar Co., Ltd., asking the Council to reconsider the question of the resumption of the "pay-as-you-enter" system, more especially as women were now employed as conductors. After discussion, it was decided to forward the letter, with a proposal "to alter and restore to their original position and condition the stairs and platforms on the cars for some time in use on the system known as P.A.Y.E. cars," to the Tramways Committee for consideration and report.

Ayr.—Annual Report.—In his annual report on the working of the Corporation tramways, the general manager (Mr. Wm. Grant) states that the revenue for the year amounted to £17,984, being a decrease of £1,392 as compared with the previous year. Receipts per car-mile worked out at 9·17d., as against 9 86d. for the previous year. The number of miles run by the cars were 448,725, an increase of 3,923 miles. The electrical energy consumed during the year was 442,969 units, or ·98 of a unit per car-mile, as compared with ·94 of a unit per car-mile in the previous year. Working expenses, exclusive of power charges, amounted to £8,476.

Australia.—The Electrical Supply Co., of Victoria, has contracted to give a supply of electrical energy for the Ballarat and Bendigo workshops of the Victorian railways for a periods of five years.

Birmingham.—The Corporation Tramways Committee is appealing to professional business men who are ineligible for the Army to volunteer to train as tramway drivers. The tramway services will have to be reduced unless men are found to replace the large number who have enlisted.

Blackpool.—Contract Tickets.—The proposal to increase the price of tramway contract tickets from £3 to £4 per annum was discussed at a meeting of contract holders last week, and a resolution was adopted protesting against the proposed increase, and also requesting the issue of sectional contracts at 30s. It was stated at the meeting that 163 persons who held contracts—there are nearly 1,500 contract holders in the town—had declared that they would not pay the increase.

Burnley.—War Bonus.—The Association of Tramway Workers has applied to the Corporation for a war bonus of 3s. per week on behalf of the conductors and drivers, but the General Purposes Committee cannot see its way to accede to the request.

Croydon.—Traffic Receipts.—The net increase in the traffic returns of the Corporation tramways over the corresponding period of last year was £2,600, or £4,378 gross. In the same period 250,000 more passengers had been carried on a reduced mileage run of 3,500, and a decrease of 100 units in energy consumption.

Darwen.—War Bonus.—The Tramways Committee has received a request from the Association of Tramway Workers for a war bonus of 3s. on behalf of the drivers and conductors. It has been decided to receive a deputation, to include 10 of the employés.

Glasgow.—Female Motor Drivers.—Owing to the lack of motormen, it is now proposed to ask the women conductors if they are prepared to undertake the driving of the cars, should the necessity arise.

Halifax.—Six Months' Working.—For the six months ended September 30th the income from the tramways amounted to £62,081, as compared with £61,303 for the corresponding period of the previous year. The expenditure was £49,537, compared with £48,676. The profit was £12,544, as against £12 620.

The Tramways Committee has authorised the borough engineer to reconstruct the tramway at North Bridge, at an estimated cost of £1,840.

Leicester. — Women Conductors. — The T.C. has decided to employ women conductors on the tramcars.

London.—L.C.C.—The Highways Committee reports that a licence has been entered into with the P.L.A. in respect of the additional condensing water facilities at the Greenwich generating station, under which the Council is to pay the P.L.A. £200 a year from March 1st, 1915, to February 29th, 1916; £400 a year from February 29th, 1916. provided that the output of the station does not exceed 43,000 kw.; £600 a year when the output exceeds 43,000 but does not exceed 47,500 kw.; £800 a year when the output exceeds 47,500 but does not exceed 52,000 kw. In the event of the output of the station exceeding 52,000 kw., or the existing suction plant assessed at £600 a year being removed, the amount payable by the Council is to be reassessed.

The Committee reports that the B. of T. has now agreed to the running of trailer-cars on authorised routes at all times of the day.

L.C.C.—Female Conductors.—It is suggested that women should be employed on the Council's trailer and single-deck cars only, to the number, approximately, of 120. Questions have been raised by the Trade Unions regarding the conditions of labour, and are now under discussion. In engaging men for tramway service preference is being given to wounded soldiers who have left the service.

Manchester.—New Depot Opened.—The car-shed extension and new stores at Hyde Road were formally opened on Tuesday by the Lord Mayor, who was presented with a gold key by Ald. Bowes, chairman of the Tramways Committee. Ald. Bowes himself was presented with a piece of plate in recognition of his 25 years' municipal service. The Hyde Road sheds and roofed buildings now cover over 10 acres, and there is accommodation there for 355 cars, the new extension (which has cost £46,000) having increased the capacity to the extent of 90 cars.

Ald. Bowes stated on Tuesday that 2,060 men from the tramway department had joined the Colours, and the allowances to the dependents and the war bonuses to those workers now employed meant something like £90,000 per annum, £70,000 being paid to dependents and the rest being war bonuses.

Newcastle.—Owing to the shortage of men and in order to meet the demand for additional cars for the service of workmen employed on Government work, the Tramways Committee has adopted the recommendations of Mr. Hatton, the manager, and will run 200 cars in the workmen's services, both morning and evening, the whole of which will be available to workmen with coupons; to provide this service most of the cars would start at 5 p.m. and finish at 9.30 p.m. At present 135 workmen's cars are run in the morning and 43 in the evening; the traffic staff consists of 487 men and boys, 158 women conductors, and 76 volunteer motormen and conductors.

New Zealand.—The Napier B.C. has decided to raise a loan of £37,500 for the construction of tramway track, overhead works, extension of car-sheds, purchase of five cars, and installation of one engine with equipment at the power house.—*B. of T. Journal.*

Oldham.—The application of tramwaymen for a war bonus of 3s. per week has been referred to a Special Committee of the Corporation, which is considering the whole question of war bonuses as it affects the various municipal departments.

References at a recent meeting of the Tramways Committee to the satisfactory way in which the new women car-conductors are doing their work have apparently given offence to some of the male workers. At a meeting of the Committee last week, it was pointed out that the remarks were not intended as a criticism of the men.

Rochdale. — Women Conductors. — The Tramways Committee has authorised the tramway manager to engage the services of women as car-conductors should the necessity arise.

With reference to the request of tramwaymen that a permanent advance of wages should be granted in lieu of the war bonus, a deputation from the workers' union waited on the Tramways Committee last week, and as a result the Committee has decided not to renew the war bonus arrangement when it expires on November 18th. A Special Sub-Committee was appointed to consider the question of an advance of wages.

TELEGRAPH and TELEPHONE NOTES.

Wireless Telephony.—It is reported that on October 20th officials at the naval wireless station, Washington, U.S.A., called up the Eiffel Tower in Paris by means of a wireless telephone, and afterwards learned that they had been heard. The Eiffel Tower is not provided with wireless telephone equipment capable of replying, but the officers stationed there cabled their acknowledgment of the American message, together with their congratulations on the achievement.

Dr. Lee de Forest is reported to have said to a representative of the *Electrical World* that the Western Electric Co.'s engineers used in the Arlington installation "some 300 audion oscillion bulbs in multiple, from each of which they obtained about 0·5 ampere of high-frequency current," and to have claimed that the use of the audion principle had made trans-Continental telephony possible. Prof. Pupin said that the greatest problem of all wireless work, particularly wireless telephony, was the elimination of static disturbances; he had solved this problem, but because of pending patents, he was not at liberty to state what the solution was.

Mr. E. J. Nally, general manager of the Marconi Wireless Telegraph Co. of America, said that the work of Dr. Lodge and of Mr. Marconi in tuning the circuits was indispensable, and that undoubtedly Prof. Fleming's invention of the vacuum valve was "the keystone of the arch on which this successful demonstration is supported." It seems clear that the thermionic principle is the basis of the present achievement, as it was also of the trans-Continental wire telephony that was accomplished in January last.

Further particulars have now been received regarding the important progress that has been made in the United States. It is reported that speech transmitted from the wireless station at Arlington to San Francisco was also heard at Pearl Harbour in Hawaii, 4 900 miles away. While the details of the apparatus employed have not yet been disclosed, it is understood that the system depends upon thermionic apparatus used as relays, as generators of high-frequency currents, and as amplifiers. In the *Electrical World* it is stated that the American Telephone and Telegraph Co. erected an experimental station early this year and commenced transmission from this point to existing stations up to 200 miles away; later, a receiving station was erected about 1,000 miles from the sending station, and the results of the experiments conducted between these led to the trans-Continental achievement recorded in our pages on October 8th.

The above-named company and the Western Electric Co. obtained the use of the Navy Department station at Arlington, and succeeded in transmitting speech from there to Darien, on the Isthmus of Panama, 2,100 miles away, on August 27th, and to San Francisco, 2,500 miles, on September 29th. An important feature of the latter tests was the successful relaying of speech transmitted by wire from New York to Arlington, and by wireless from that point to San Francisco. The wave length used was about 6,000 metres, and the sending antenna current was about 100 amperes. The standard office instruments were used for sending and receiving. Conversation between the United States and Japan and Europe is now within the bounds of possibility. Atmospheric disturbances constitute the principal obstacle. Mr. J. J. Carty, chief engineer of the American Telegraph and Telephone Co., anticipates that the function of wireless telegraphy will be primarily to reach inaccessible places where wires cannot be strung, and to act as a feeder and extension to the wire system. Owing to atmospheric interference, it can never replace the wire, and the fact that any listener provided with a suitable receiver can hear the message is a fatal bar to its commercial use.

CONTRACTS OPEN and CLOSED.

OPEN.

Bradford. — November 13th. Corporation. Twelve months' supply of lamp fittings, insulating material and tramway stores for the Tramways Committee. Specifications from the Tramway Offices, 7, Hall Ings.

Cape Town. — November 5th. Corporation. One 4,000-k.v.a. (or alternatively smaller or larger, according to whichever can be delivered earliest) steam-turbine-driven alternator; also one 1,000-kw. converting plant. Specifications, &c., from Messrs. Davis & Soper, 54, St. Mary Axe, E.C.*

Australia.—December 7th. P.M.G.'s Department (various States). Non-encrusting zincs, carbon and manganese powder, manganese chloride, chloride of ammonia, porous pots (2 in.), outer jars for cells, carbon blocks, resistance boxes of 5,000 ohms, &c. See "Official Notices" October 15th.

Sydney.—December 6th. Municipal Council. 33,000-volt outdoor transformers and switchgear. Specifications (10s. 6d.) from Electric Light Department, Town Hall.

December 20th. Metropolitan Board of Water Supply and Sewerage. Centrifugal pumps and electric motors at the Marrickville low-level pumping station.

January 12th, 1916. N.S.W. Railway and Tramway Department. Two water-tube boilers, &c., for the Zara Street power house, Newcastle. See issue of October 8th for further particulars.

January 31st, 1916. Three electrically-operated railway freight-car transferers, for Jones Bay wharfage, Pyrmont. Particulars from Engineer-in-Chief of the Harbour Trust, Circular Quay.

Melbourne.—December 14th. Deputy P.M.G. Eleven sections of a lamp-signalling trunk-line switchboard, and other material necessary for increasing the equipment of Melbourne trunk exchange from 108 to 240 lines. Schedule 1,207.*

December 14th. P.M.G. For delivery in all States, 18,670 common-battery wall pattern telephones, manufactured in Australia. Sched. No. 1,264. Tenders will also be considered for instruments manufactured in countries other than Australia.

January 5th, 1916. Installation of automatic sprinklers and thermostats at Jolimont car-shed. Chief Storekeeper, Railway Offices, Spencer Street, Melbourne.

Perth.—December 8th. 294 accumulators, and power board complete, for P.M.G.'s Dept. See "Official Notices" October 8th.

Dublin.—November 4th. Great Northern Railway Co. (Ireland). Twelve months' supply of stores, including a number of electrical items. See "Official Notices" October 15th.

November 15th. Twelve months' supply of stores for Dublin United Tramways Co. See "Official Notices" to-day.

Grimsby.—November 4th. Corporation. House service boxes (lead), and fittings; house fuse boxes and fittings. See "Official Notices" October 22nd.

Lanark.—November 1st. The District Committee of the Middle Ward of the County of Lanark invites tenders for executing the electric lighting works at Hairmyres Colony, East Kilbride. Schedules from the consulting engineer, Mr. William Arnot, 163, Hope Street, Glasgow.

London.—November 3rd. L.C.C. Installation of 193 wiring points, 240 lights, at Thornfield Road Elementary School, Coverdale Road, Hammersmith, W. See "Official Notices" to-day.

Manchester.—November 16th. Tramways Committee. (*a*) steel girder tramway rails; (*b*) permanent way special track work; (*c*) permanent-way points, tongues and crossings. Specifications, &c. (one guinea each, returnable), from Mr. J. M. McElroy, General Manager.

New Zealand.—Dunedin.—November 3rd. City Council. Insulated and bare copper wire for a period of two years.* November 3rd. City Council. One 3,000-volt regulator.*

Rochdale.—Contract A 107. Ash-handling system, with hoist and bunker, with discharge chutes, for Dane Street electric power station. C. C. Atchison, M.I.E.E, Engineer and Manager, Dane Street.

Spain.—November 11th. The municipal authorities of San Ildefonso (Province of Segovia) are inviting tenders for the concession for the electric lighting of the town.

St. Helens.—November 17th. Erection of engine house and other works at Cropper's Hill power station. Particulars from Mr. E. M. Hollingsworth, Borough Electrical Engineer (£1 1s. returnable).

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Australia.—The Electricity Committee of the Sydney Municipal Council recommends that the following material be ordered under existing contracts:—

20,000 type C straight-stem insulators, £790.—W. G. Watson & Co., Ltd.
12,000 10,000-volt straight-pin insulators; 6,000 10,000-volt strain insulators; 2,000 33,000-volt straight-pin insulators, £4,350.—F. S. Lee.
6,000 33,000-volt strain insulators, £2,250.—Australian General Electric Co.

The City of Melbourne Municipal Council has accepted the following tenders:—

Meters and maximum demand indicators.

Group A: £580.—Edison & Swan United Electric Light Co.
" B: £192.—Ferranti, Ltd.
" C: £727.—Reason Manufacturing Co., Ltd.
" D: £910.—General Electric Co., Ltd.
" E: £69.—British Westinghouse Co. —*Tenders.*

The following contracts have been placed:—

Postmaster-General's Department, Victoria.

8 tons hard-drawn copper-wire, 600 lb. per mile, £908.—British Insulated and Helsby Cables, Ltd.

Commonwealth Home Affairs Department.

Two 100-kw. suction-gas power plants, one delivered, Kalgoorlie, £3,371; one delivered, Port Augusta, £3,203.—Gibson, Battle & Co.

Prahran & Malvern Tramway Trust.

1,050 tons of rails, £13,355.—R. W. Cameron & Co.

Postmaster-General's Department, Melbourne.

50 miles two-twisted rubber-insulated copper wire, £387.—Siemens Bros Dynamo Works.
100 miles twisted pair V.I.R. copper wire, £1,625; 4 tons tinned copper rubber-insulated wire, £700.—Callender's Cable and Construction Co., Ltd.

—*Aust. Statesman and Mining Standard.*

Chorley.—The B. of G. has accepted the tender of the Turner-Dictograph Telephone Co. (£140 10s.) for an installation of telephonic intercommunication throughout the workhouse.

Dublin.—The following tenders were received by the Pembroke U.C. for the erection of a cooling tower at the South Lott's electricity works:—

Wm. Beckett & Son, Ltd.	(accepted)	£374
J. Pembroke & Son		598
Premier Cooling and Engineering Co.		457
Davenport Engineering Co.		550
W. H. Roy & Co.		339

Irish Builder.

London.—L.C.C.—The Stores and Contracts Committee reports that the current contracts for the supply of general stores will, with a few exceptions, expire on December 31st, 1915. This group of contracts is the largest of the several groups dealt with each year, and generally includes all such goods as metals and metal goods, electric cables, lamps, fittings and materials, chemical and scientific goods, &c. Owing to the special circumstances which have arisen in consequence of the war, it is proposed to continue the present practice of purchasing some classes of goods at the current market rates or under special quotations, until trade conditions again become normal or until it is considered that the time is favourable for new contracts to be entered into. In all other cases new forms of tender and schedules are being issued, The tenders will be received o November 1st and November 8th, 1915, and, as the number of tenders will probably be comparatively large, the Committee recommends that the Stores and Contracts Committee be authorised to open the tenders to be received for the supply of the goods included in the general stores schedules, 1916.

The Highways Committee has received the undermentioned tenders for the supply of boiler fittings for the Stirling boilers at the Greenwich generating station:—

	Price of each nose piece. Item A.	Item B.	Item C.
	s. d.	s. d.	s. d.
T. Summerson & Sons, Ltd.	2 8	2 7	2 7
R. Hyde & Son, Ltd. (accepted)	2 8	2 8	2 8
The Brigh.stue Foundry Engineering Co., Ltd.	3 0	3 0	3 0
A. T. Green & Sons, Ltd.	3 2	3 0	3 0
Bricknell, Munro & Rogers, Ltd.	3 9	3 9	3 9
J. Crowley & Co., Ltd.	5 4	5 3	5 3

The lowest tenderer was unable to offer satisfactory delivery. In view of the exceptional circumstances prevailing, the Committee has authorised the purchase of coal for use at the Greenwich generating station, as and when it can be obtained; about 4,768 tons of coal have been purchased under contract, at a cost of £4,380, and about 26,490 tons out of contract, at an approximate cost of £34,464.

The Committee has also purchased from Messrs. Wm. Cory & Son 10,000 tons of coal, at 30s. per ton, to be stored by the firm, and to be delivered at the generating station as and when required within 12 months from August 1st, 1915.

The undermentioned tenders have been received by the Highways Committee for the supply of machine tools for the third section of the central car repair depôt:—

Name of firm.	Universal grinding machine.	Measuring machine.
A. A. Jones & Shipman, Ltd. (accepted)	£115 0	—
H. W. Ward & Co.	145 0	—
C. W. Burton, Griffiths & Co.	184 0	£26 5
Pollock & Macnab, Ltd.	187 10	—
The Selson Engineering Co., Ltd.	192 10	—
Chas. Churchill & Co., Ltd.	228 0	—
Buck & Hickman, Ltd.	231 0	£141 15 (accepted) plus 2½ per cent.

The Committee accepted the following tenders for the purchase and removal of old materials from depôts for the ten months ending July 31st, 1916:—

Thos. W. Ward, Ltd.—Steel rails, small, Tee section, from the central stores, and steel track shoes from the central car repair depôt.

Samuel Isaacs & Sons.—Steel track shoes and cast-iron (various) from the central stores.

Moss Isaacs, Ltd.—Cast-iron brake blocks from the central stores, and cast-iron, fishplates, cuttings from rails and short pieces of rail from Belvedere Road depôt.

George Cohen, Sons & Co.—Points and crossings from Belvedere Road depôt, and steel car tires and iron and steel (heavy) from the central car repair depôt.

Donald McCall & Co.—Turnings and borings and iron and steel (light) from the central car repair depôt.

C. A. Robinson & Co.—Cast-iron from the central car repair depôt.

The Highways Committe has received the undermentioned tenders for the supply of a new motor required in connection with the testing of electricity meters :—

General Electric Co., Ltd. (not to specification)	.. ..	£101
.. .. .. (alternative)	.. ..	139
Electromotors, Ltd.	(accepted)	105
Veritys, Ltd.	..	144

The estimate of the chief engineer was £105.

The Committee has also agreed, in exceptional circumstances, to increased prices being paid to three contractors for the supply of tramway fittings, &c., under the annual contracts for 1915-16.

BATTERSEA.—The Electricity Committee recommends the acceptance of the offer of Messrs. R. Dempster & Sons, Ltd., for the provision of a run-way in the rotary room at the generating station for £135.

HAMMERSMITH.—The Electricity Committee reports that for the supply of seven additional transformers of 50, 100 and 200 KW, five tenders were received, including a proposal from the British Electric Transformer Co., Ltd., to supply the transformers, as required, over a period of three months, at the same prices as those accepted on July 8th, 1914, plus 7½ per cent. in the case of the 200-KW. transformers. The Committee, after comparison with the other tenders, finds that the company's terms are the most favourable, and having regard that the plant previously supplied by the company has given every satisfaction, recommends the Council to enter into a contract with the British Electric Transformer Co. on the terms submitted.

For the supply of 1,350 yards of feeder cable in the Hythe Road district, the following tenders have been received :—

Western Electric Co., Ltd.	£1,285
Johnson & Phillips, Ltd.	1,310
W. T. Henley's Telegraph Works Co., Ltd.	1,312
British Insulated and Helsby Cables, Ltd.	1,312
Callender's Cable and Construction Co., Ltd. (accepted)	1,312
W. T. Glover & Co., Ltd.	1,342
Siemens Bros. & Co., Ltd.	1,351
Macintosh Cable Co., Ltd.	1,400

The Committee reports that, in considering the above tenders, it was impressed by the desirability, at the present time, of arranging that, where possible, contracts of this nature should be placed with houses which are entirely British, subject to such houses being able to supply in accordance with the Council's specification. In these circumstances, and in view of the fact that the Council has formerly been supplied with cable, which has proved most satisfactory, from Messrs. Callender's Cable and Construction Co., Ltd., the Committee is of opinion that that company's offer should now be accepted.

Manchester.—The Education Committee has accepted the tender of Messrs. Seddon & Sons, Manchester, for an electric lighting installation in the extension of the Harpurhey Girls' High School.

New Zealand.—The Public Service Stores and Tender Board, Wellington, has received the following tenders :—

1,500 red and 2 000 white three-conductor cords :

Lawrence & Hanson Electrical Co. ..	(accepted)	£489

3,000 B.B. wall telephones, 1,000 ohms :

B. L. Donne	(accepted)	£8,250
G. Winter	..	7,900
Richardson, McCabe & Co., Ltd.	..	8,043
India-Rubber, G.-P. and Teleg. Works Co., Ltd.	..	9,887
R. W. Cameron & Co., ...	..	9,950
Alternative	..	9,627
Alternative	..	10,597
Alternative	..	10,286

25 miles twisted pair V.I.R. insulated cable :

Hughes & Cossar	(accepted)	£337
Richardson, McCabe & Co.	..	256
Lawrence & Hanson Electrical Co.	..	301
A. & T. Burt, Ltd.	..	315

New Zealand Shipping and Commerce.

Plymouth.—The Corporation Tramways Committee has accepted the tender of the Brush Electrical Engineering Co., for bodies for six new tramcars ; and that of the British Westinghouse Electric and Manufacturing Co., Ltd., for electrical equipments for the same.

Rawtenstall.—The Electricity Committee has placed a contract with Messrs. J. Morris & Co., for 2,000 tons of Astley and Tyldesley slack, for the electricity works during the ensuing six months. It has also accepted the tender of Messrs. Davideon for a fan in connection with the induced-draught plant at the electricity works, and that of the British Thomson-Houston Co., Ltd., for the motor for driving the fan.

Salford.—The Health Committee has accepted the tender of Mr. E. Beal, of Eccles, to supply during the next 12 months 500 Mazda electric lamps, at £8 6s. 8d. per 100, to Ladywell Sanatorium.

The Tramways Committee has accepted the tender of Messrs. Frances Motors, Ltd., of Gaythorne, Manchester, for the supply of two Ford motor-vans.

The Electricity Committee has accepted the following tenders :—

W. Geipel & Co., London.—20,000 pairs of flame arc lamp carbons, £131.
Earl of Ellesmere.—2,000 tons No. 1 washed slack coal, 16s. per ton.
Andrew Knowles & Sons, Ltd., Pendlebury.—2,500 tons washed slack coal, 17s. per ton.

Taunton.—The T.C., in order to have a reserve stock of coal for the electricity works, has decided to extend the contract with Messrs. Cory Bros. to cover 2,600 tons, at £1 5s. 6d. per ton delivered, this being the estimated consumption for a year after the expiration of the current contract.

FORTHCOMING EVENTS.

Institution of Mechanical Engineers.—Friday, October 29th. At 8 p.m. At Institution of Civil Engineers, Great George Street, S.W. "Thomas Hawksley" lecture on "The World's Sources of Fuel and Motive Power," by Dr. D Clerk, F.R.S.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, October 29th. At 7.30 p.m. At Bolbec Hall, Newcastle. General Meeting. Inaugural address by the president, Mr. H. B. Rowell.

University College (University of London).—Friday, October 29th. At 5 p.m. First of six lectures on "Electric Heating and Electric Furnaces," by Prof. J. A. Fleming, F.R.S.

Greenock Electrical Society.—Friday, October 29th. At 7.45 p.m. At Temperance Institute, 19, West Stewart Street. Paper on "Cable Jointing," by Mr. J. L. Hogg.

Association of Mining Electrical Engineers (Lancs., Cheshire and North Staffs. Branch).—Saturday, October 30th. At 6.30 p.m. At Grosvenor Hotel, Deansgate, Manchester. Presidential address by Mr. G. S. Corlett. Paper on "Colliery Electric Lighting," by Mr. Corlett, will be discussed.

Association of Mining Electrical Engineers (Notts. and Derbyshire Branch).—Saturday, October 30th. At 3.30 p.m. At University College, Nottingham. Paper on "The Use and Abuse of Oils on Mining Plant," by Mr T. C. Thompson.

Association of Supervising Electricians.—Tuesday, November 2nd. At 8 p.m. At St. Bride's Institute, Bride Lane, E.C. Paper on "Accumulators," by Mr. R. Rankin.

Institution of Civil Engineers.—Tuesday, November 2nd. At 8 p.m. At Great George Street, S.W. Presidential Address by Mr. A. Ross.

Rontgen Society.—Tuesday, November 2nd. At 8.15 p.m. At Institution of Electrical Engineers, Victoria Embankment, W.C. Presidential Address, by Mr J. H Gardiner. Exhibition of New Apparatus.

Institute of Marine Engineers.—Tuesday, November 2nd. At 7 p.m. At Tower Hill, E. Paper on "Development in Mechanical Ventilation Hygienically, Aboveground, Underground, and Underdeck," by Mr. J. Keith.

Chemical Society.—Thursday, November 4th. At 8.30 p.m. At Burlington House, W. Ordinary Meeting.

University College, London.—Friday, November 5th. At 5 p.m. Second Lecture on "Electric Heating and Electric Furnaces," by Prof. J. A. Fleming, F.R.S.

Salford Technical and Engineering Association.—Saturday, November 6th. At 7 p.m. At Royal Technical Institute, Peel Park. Members' Short Papers.

NOTES.

The Russian Language.—The Council of the North-East Coast Institution of Engineers and Shipbuilders has, in a recent circular to its members, drawn attention to classes in Russian that have been arranged under the auspices of Armstrong College. They are being held at the College of Medicine, Northumberland Road, Newcastle-on-Tyne.

Electricity in Wool.—The question of electricity in wool manufacture is receiving serious consideration just now by textile experts in the West Riding of Yorkshire, and research work is proceeding. A member of the Council of the Textile Institute states that not only are woollen spinners subject to troubles caused by the presence of static electricity in their staple, but the same effect is found to a lesser degree when cotton and silk are under treatment. Several methods for the eradication of the trouble have been tried, notably electric neutralisers and radio-active salts, the latter ionising the air between the fibres and an earth-plate, and thus enabling the electricity to escape to earth.

Institution and Lecture Notes.—National Illumination Committee of Great Britain.—A meeting of this Committee was held at the Institution of Electrical Engineers on October 20th, when it was reported that Mr. Jacques Abady, of London, had been nominated by the Institution of Gas Engineers as a member of the Committee, to fill the vacancy caused by the death of Mr. Edward Allen, of Liverpool. The Committee elected Mr. W. Duddell, of London, to be its chairman, in succession to the late Mr. Edward Allen, and Mr. John Bond, of Southport, to succeed Mr. Duddell as one of the vice-chairmen. Reports on observations carried out, at the instance of the Committee, at a number of technical laboratories, on the height to which the flame of the Hefner amyl-acetate lamp should be raised to afford a light of one International or English standard candle, were discussed, and a report prepared by Dr. E. Ott, of Zurich, on researches which had been carried out in Switzerland on the "Effect of Atmospheric Pressure, Humidity, and Vitiation on the Light afforded by the Hefner Standard Lamp," was considered.

Institution of Electrical Engineers (Newcastle Local Section).—The chairman, Mr. P. V. Hunter, will deliver his inaugural address on Monday, November 8th. The only other arrangement yet made for the session is for January 10th, 1916, when Mr. J. R. Beard will probably give his paper on "The Design of High-Pressure Transmission Systems." Mr. J. R. Andrews is the hon. sec. of the Section.

Electrolytic Copper in Germany.—The share capital of the Huttenwerk Niederschonweide is being increased from £77,500 to £150,000, for the purpose of erecting plant on an existing available site for the production of electrolytic copper. It is stated that the plant will be brought into use at the beginning of next year.

Appointments Vacant.—Assistant engineer, junior shift engineers, station fitter, engine drivers, stokers, stoker trimmer, wireman and mate, for a Military Camp in North Yorkshire ; switchboard attendant (27s. 6d.), for Borough of Lancaster ; plumber-jointer (£2 2s) for Newport Corporation ; temporary shift engineer (38s.), for Pembroke U.D.C. Particulars are given in our advertisement pages.

Inquiry.—Makers of the "Rapid" vacuum cleaner are asked for.

Volunteer Notes.—Engineering Institutions' Volunteer Training Corps.—

Company Orders.—By Lieut.-Col. C. B. Clay, V.D., Commandant, for week commencing November 1st, 1915 :—

Drills, 6.15 to 7.15 ; 7.15 to 8.15 p.m.

Monday, November 1st.—Section 1, Technical ; Section 4, Squad or Working Party.

Tuesday, November 2nd.—Section 2, Technical ; Section 3, Shooting Working Party.

Thursday, November 4th.—Section 3, Technical ; Section 2, Shooting Working Party.

Friday, November 5th.—Section 4, Technical ; Section 1, Squad or Working Party.

Saturday, November 6th.—Company Parade 2.30 p.m.

Sections for Technical Drill will fall in at the Headquarters of London Electrical Engineers (T.F.), at 46, Regency Street, S.W.

Sections for Squad, Signalling, Shooting and Working Parties will fall in at the new Headquarters, Chester House, Eccleston Place, S.W. All Members who have not yet been measured for Uniforms will attend at Headquarters, on Friday, the 5th inst., for this purpose. All men who draw haversacks and water bottles for week-end Working Parties are requested to return them to Headquarters on the following Monday. Members desiring to have their own haversacks and water bottles can purchase them at Gamages'. The following Corporals have been appointed :—C. McArthur Butler, Section 2 ; H. J. Golding, Section 3 ; B. C. Garman, Section 4 ; R T. Morris, Section 4 ; T. Spiers, Section 3 ; H. Jantzen, Section 2 ; E. A. Ullmann, Section 1 ; J. M. Smith, Temporary Corporal.

E. G. Fleming,
Company Commander and Acting Adjutant.

3rd Batt. (Old Boys) Central London Regiment (Volunteers).—Battalion Orders by Colonel S. G. Grant (Officer Commanding), Thursday, October 28th, 1915 :—

Week-end Parades.—Saturday.—The Battalion will parade, as strong as possible, at Baker Street Station at 2.30 p.m., and proceed by train to Wembley Park, for Field Operations. Orders have been issued to those concerned.

Sunday.—The Battalion will parade at Liverpool Street Station (Low Level entrance, G.E.R.) at 9.30 a.m., and proceed by train for Entrenching duties, returning at 4.59 p.m.

The Quartermaster will make the necessary arrangements for Lunch.

Special Employment.—Names of men are required at once who will volunteer and are suitable for special employment, the nature of which they can ascertain by applying to their Company Commanders. As the Authorities require this return by November 1st, members are requested to give their names in as soon as possible, and Company Commanders must hand them in to the Adjutant on Parade next Sunday, the 31st inst.

Musketry.—Saturday next, the 30th inst. There will be shooting at both Acton and Bisley Ranges, as usual. Members proceeding to Acton must parade there at 2 p.m. punctually. Those shooting at Bisley must report themselves to Sergeant Cotter, at the barrier of No. 9 Platform, Waterloo Station, at 12.45 p.m.

Tuesday, November 2nd. Shooting at Acton, as usual, at 2 p.m.

A. G. Joiner, *Major and Adjutant*, O.B.C.

Zinc from Quebec.—The first Canadian zinc reduction plant to be started in Canada will be in operation before November 1st. The newly-incorporated Canadian Zinc Co., which is owned by the Weedon Mining Co., has acquired a large industrial plant, and has entered into a contract for electricity, the present arrangement being for an initial allotment of 1,000 h.p. Initially United States ores will be used, but it is expected that in a few months the mills will be supplied from the mines owned by the company at Nottingham (Quebec).—*Financier.*

Quoting from a U.S. Consular report, the *Chemical Trade Journal* says it is officially announced by the President of the Consolidated Mining and Smelting Co., Toronto, that the Dominion Government has contracted with that company for the entire output of the new zinc reduction plant now being installed at Trail, British Columbia. After long experimentation the metallurgists of this company have discovered a satisfactory process of reducing the ores by electrochemical treatment, the experimental plant being now capable of producing 500 to 1,000 lb. a day. It is said that the Trail smelter will be one of the best in America, and that it will be producing 25 tons of spelter a day before the end of the year. The new zinc plant will be installed with a capacity to use 10,000 hydro-electric h.p. from the West Kootenay Power Co.

The Navy's Need for Skilled Engineers.—Munition work, as we understand it to-day, that is to say, work in the shop and the factory, forms by no means the only opportunity for skilled engineers to serve their country at the present time. The Navy is always glad of their services. Transference from munition work to the Navy is not encouraged, but amongst those skilled mechanics who are not at the present moment engaged on munition work there must be many who would be glad to find an outlet for their technical abilities, by becoming members of the Naval Service. It is felt that if the opportunities and the requirements which exist in this respect were more fully known, there would be no difficulty in keeping up the supply of electrical artificers and engine-room artificers who are needed by the Navy. This branch of Naval Service has many attractions, not the least of which is the comparatively high pay received, which amounts, on entry, to nearly £2 per week, and which may be very considerably improved by good service. Thus, with much better pay and prospects than those of the ordinary seamen, they have the same opportunity for seeing the world, and for leading a fine, healthy open-air life, at the same time as driving their own trade, which usually keeps them so closely confined to the work-shop. As they enter the Navy with the rating of chief petty officers they mess in the chief petty officers' mess and have the same opportunities for leave when they are in port. If they are sufficiently skilled they are drafted at once on to a battleship and come immediately to grips with their work. Their opportunities for advancement to commissioned rank are excellent. During the period of the war, men are accepted between the ages of 21 and 45. For rating as engine-room artificers, men who have experience and are competent workmen in the trades of engine fitters and turners, coppersmiths, boiler makers, and engine smiths are required. An examination is usually held on entry, but in the case of a candidate who holds a Board of Trade certificate as a first class or a second class engineer, and can produce certificates of character and ability from the works in which he has learnt his trade, exemption is granted. Engine-room artificers are entered as chief petty officers, a position which carries with it many privileges. A free kit is provided on entry, and this, of course, is not the ordinary blue-jacket's slacks and jumper, but what is known in the Navy as "fore-and-aft rig," that is to say, a peak cap and reefer jacket. Fitters, turners and instrument makers are required by the Navy as electrical artificers. Candidates for this rating are accepted for the period of the war between the ages of 21 and 45. The pay is the same as that of engine-room artificers, and an examination in fitting and turning or instrument making is imposed. Electrical artificers may be recommended for a practical course of training which is carried out on board the *Vernon*, which is moored at Portsmouth, or on board the *Defiance* at Devonport. During this period they may be accommodated either on board ship, or in the magnificent Naval barracks which are situated in these two towns. This avenue to naval life is certainly one not to be neglected by the skilled engineer. There is no quicker way of entering for actual service, and none which secures immediately better pay, prospects and position. Entering the Navy as a chief petty officer he immediately steps into a rank which takes the man who enters as ordinary seaman many years to achieve.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Electricity Committee of the St. Pancras B.C. has recommended that the wages of the boiler foreman at the King's Road electricity station be increased from £2 15s. to £3 per week.

Mr. J. A. H. Clifford has been appointed engineer-in-charge of the Belfast Corporation electricity station, and Mr. Girvan, switchboard attendant, has been promoted junior engineer-in-charge.

General.—Mr. J. F. Avila has been appointed works manager at the Birmingham works of Simplex Conduits, Ltd. Important business operations have necessitated certain changes, and these having to be made hurriedly, Mr. Avila was unable to take leave of all his London district friends. For the last nine years he has acted as London manager to this company, and has been in touch with many electrical men in the London district.

The North-East Coast Institution of Engineers and Shipbuilders at its meeting to-night will present Institution gold medals as follows for papers read last session :—Mr. J. W. Hobson, for a paper on "Industrial Locomotives" ; Mr. E. W. Fraser Smith, for a paper on "The Future of British Engineering and Shipbuilding."

Mr. W. Dundas Fox, power representative to the Bradford Municipal electricity department, has resigned his position, and has joined the staff of the British Westinghouse Electric and Manufacturing Co., Ltd., at Trafford Park.

The wedding took place at Christ Church, Eccleston, a few days ago, of Mr. Robert C. Shaw, of Prescot, and Miss Gwendoline D. Wheeler, of Eccleston Park, Prescot. Among the presents received were a marble clock and afternoon tea-cups from the staff at the British Insulated & Helsby Cable Works.

The following announcement appears in the *London Gazette* :—Royal Marines Submarine Miners, Temp.-Lieut. to be Temp.-Capt., Horace M. Taylor.

At St. Mary's Parish Church, Whitby, on October 20th, the marriage took place of Mr. Wm. Harold Cowling, electrician, Saltburn-by-the-Sea, and Miss Margaret Jane Barry, of Whitby.

The marriage has taken place at Tarrant Monkton Church, Dorset, of Mr. Leslie Hampden Pratt, of Streatham, and Miss Victoria Agnes Hall, second daughter of Mr. Edward H. Hall, Rugby. Mr. Pratt is serving in the Royal Naval Division.

New Justices of the Peace appointed for the County of Kent include Mr. Thos. Octavius Callender, of West Heath House,

Abbey Wood, managing director of Callender's Cable and Construction Co., Ltd., of Erith.

Lieutenant-Colonel R. E. P. Pigott, C.I.E., late of the Bombay, Baroda and Central India Railway Rifles, has been appointed to the command of a service battalion. He commanded the 1st Battalion of the Rifles for the usual period, and is the chief electrical engineer of the Bombay, Baroda and Central India Railway.

On the occasion of his marriage, Mr. W. Wood, electrical and telegraph superintendent, North-British Railway, was presented by members of the staff with a silver tea service.

The Ministry of Munitions and the Local Government Board have invited Mr. J. M. McElroy, general manager of the Manchester Corporation Tramways Department, to come to London for the purpose of advising on the best means of dealing with transit difficulties in a portion of the Metropolitan district, where munitions workers are employed in large numbers.

The *London Gazette* announces that the undermentioned have been appointed second-lieutenants in the London Electrical Engineers:—Sapper W. J. Rawlings, Sapper J. D. Ross.

Roll of Honour.—Mr. Tom A. Fraser, who was with the Electrical Co., Ltd., for 13 years, latterly as manager of the cable and metals departments, was killed in action in Flanders on October 16th. He joined the H.A.C. soon after the outbreak of war.

Sergeant-Major Eric Eaton, of the 11th Manchesters, an electrician, of Broadstairs, has been missing at the Dardanelles since August 22nd.

Private Harry Seed, of the 8th Battalion King's Own Scottish Borderers, who is reported to have been killed in France, was formerly engaged in electrical work at Stockton Heath, Warrington.

Lieutenant Fergus R. Forbes, of the Royal Engineers, formerly engaged at the Hayle (Cornwall) electricity works, has been killed in action in France.

Gunner Percy Edgar Russell, of the Royal Field Artillery, who was, prior to enlistment, with Messrs. Willans & Robinson, Ltd., of Rugby, has been killed in France.

Bugler Wilfred Lintern, 12th Battalion Rifle Brigade, who has fallen in action in France, was prior to the war engaged at the Rugby works of the British Thomson-Houston Co., Ltd.

Private Reginald Stallard, of the 10th Battalion Worcestershire Regiment, who left the staff of Messrs. Heenan & Froude, refuse destructor makers, of Worcester, to join the Forces, has been killed in action.

Lance-Corporal W. Bridgett, of the 1/5th North Staffs. Regiment, engaged until the outbreak of war with Messrs. Siemens at Stafford, has been wounded in the ankle in France, and is now in hospital in England.

Private Clifford Bentley, 12th Yorkshire Regiment, who has died from wounds received in action in France, was engaged at the electricity works of the Heckmondwike U.D.C.

Sapper A. Snow, 95th Field Company, Royal Engineers, who was on the electricity staff of Hanley Corporation, has been wounded in action in France. He is in the Whitchurch Military Hospital at Cardiff.

Private Frank Whittaker, who was, prior to the war, engaged with the Yorkshire Electric Power Co., is reported missing at the Dardanelles, where he was drafted on July 3rd.

Private H. A. Garratt, of the 1/4th Leicestershire Regiment, who was engaged with a firm of electrical engineers at Leicester, has been wounded in action, and is in hospital at Aberdeen. His wounds are in the right shoulder and hand.

Private Ernest Tuson, 4th Battalion South Wales Borderers, who has been killed in action at the Dardanelles, was an electrician engaged in the railway telegraph department at Abergavenny. Previously he was a foreman in the electrical department of the L. & N.-W.R. Co. at Warrington.

Private J. A. Ellis, of the Coldstream Guards, who was on the staff of Messrs. Siemens Bros., at Stafford, has been killed in action.

Sergeant-Major Ernest G. Thomas, of the 1/5th North Staffs. Regiment, formerly on the electricity staff at the Burslem municipal works, has been killed in action.

Obituary.—We regret to learn that Prof. Vivian B. Lewes, Professor of Chemistry at the Royal Naval College, Greenwich, chief superintending gas examiner to the City of London, and a lecturer and expert whose statements respecting the hygienic value of gas lighting and heating have frequently interested electrical men, passed away on Saturday night last. He was taken ill with double pneumonia while on a lecturing visit to Mold, Flintshire. He was 63 years of age.

The nation has lost one of its greatest ordnance experts and the head of the renowned Armstrong-Whitworth organisation, at Elswick, by the death of Sir Andrew Noble, who died last week at the age of 83 years.

We regret to record that Mr. Ernest Hartjen (of Messrs. H Hartjen & Co.) passed away on October 8th, after an operation for appendicitis. The business will be continued as usual under the personal supervision of Mr. F. W. Lang.

Mr. W. A. Luntley, who had been manager of the Wolverhampton Corporation Tramways since 1902, died on Monday after a long illness, the result of an accident. Prior to his appointment, deceased, who was a Wolverhampton man, was associated with the Birmingham tramways before they were municipalised.

CITY NOTES.

Dick, Kerr & Co., Ltd.

Mr. Claud T. Cayley (chairman) presided at the annual meeting, held on October 21st, at the Cannon Street Hotel. In moving the adoption of the report, the Chairman said that just over a year ago, when they last met, he fancied the large majority fully anticipated that before they met again the war would be over, and they would be in a position of considering their own affairs from a normal point of view. As it was, the position remained much as it was. They were in a state of suspense, living from hand to mouth, as it were; all their normal development stopped and their energies transferred to the special requirements of the time. He told them last year that, in the opinion of the directors, the company would experience some lean years after the war before they could hope for the re-establishment of their standard business, especially in heavy manufacturing, and he had no reason to alter this opinion. The profit on this year's trading was principally derived from orders and contracts taken before the war, and which were gradually falling in to a finish. These, as could be readily understood, were not being replaced by others of similar nature, so that, although they were busy now on abnormal work, there was bound to be a transition period occupied in re-establishing normal conditions; and it was because of this that the directors could not see their way to recommend a dividend on the ordinary shares. They felt that some reserve must be made to bridge over that period. He had mentioned that they were busy now, but not on normal work; and although the directors were primarily pleased because they believed they, as a company, were assisting the Government to a material extent, they were also hopeful that some reasonable profit proportionate to the efforts being made would be permitted—sufficient, at all events, to make it unnecessary next year to put such a large percentage of profit to reserve for contingencies. Clear indications, however, had been given, first in the Munitions Act, and secondly in the Budget, of the Government's intention to absorb excess profits, especially if derived from work due directly to the war. No person could object to this principle, but at the same time no one, at all events outside of the Government, could predict to what extent it would be applied, and it, therefore, behoved them to be ultra-conservative in dealing with their accounts at the present time. There was no abnormal change to draw attention to in the accounts. Contracts were larger than they had been for some years. One cause was found in the Metropolitan Water Board contract, where a very large amount of plant was required, and the work was going on, although suffering to some extent for want of labour. Another cause was in connection with certain changes and developments on the manufacturing side of the business, respecting which, however, he could not go into details. His speech was a short one, but fairly to the point. Owing to the company being engaged in work for the Government it was necessary for him to make it short. The balance-sheet was made up to June 30th, 1915, during which period they were not as heavily engaged in the manufacture of war material as at the present time, and as they expected to be in the future. The figure for contracts was £460,365, and although he had referred to contracts being large, still there had been previous years when they were larger still. It would be noticed that they had transferred £25,000 to a special reserve fund for contingencies.

Mr. R. H. Prestwich seconded the motion, and it was carried without discussion.

The retiring directors were re-elected, and Mr. John Sampson, in reply, said he thought the shareholders had reason to be fairly well satisfied with the position of affairs, considering all the circumstances.

Mr. Barber Glenn proposed a hearty vote of thanks to the board and staff, and this was seconded by Mr. Dixon, who observed that all the members of the board were practical business men, and if they could not make a success of the company, nobody could.

The vote was acknowledged by the Chairman, who paid a warm tribute to the work of Mr. Walter Rutherford, the managing director, and the staff.

Cape Electric Tramways, Ltd.

The directors report that for the year ending June 30th, 1915, the profit and loss account shows a profit of £80,615, and after providing for debenture interest, redemption of debentures, and taking into account the balance brought forward from last year, a net credit balance of £44,286 remains. From this amount the reserve fund has been credited with £12,000, leaving a balance of £32,286. The directors therefore recommend the payment of a dividend in respect of the past year of 5 per cent. on the ordinary share capital of the company. This will absorb £24,561, leaving a balance of £7,725 to be carried forward. During the year the tramways carried 21,680,070 passengers, earning £206,123, as against 20,886,146 passengers, earning £200,409 in 1913-14. While the traffic shows some expansion, the state of war in South Africa during the year under review has added considerably to the working

costs of the tramways by reason of the additional cost of labour and the allowance granted to those employés who have gone on active service, over and above which, there is also an increase in the cost of all supplies. The profit on the year's working must, therefore, be regarded as satisfactory, especially as it has had to be earned in a period covering the Rebellion and the German South-West African Expedition. The conditions prevailing call for the exercise of economy and retrenchment wherever possible, and the management in South Africa is fully alive to the necessity of most careful supervision in every department of the company's business. The directors again refer to the valuable services rendered by the local boards in Cape Town and Port Elizabeth, also by the general managers in Cape Town and Port Elizabeth, and the staffs under them. Mr. Jameson, who was secretary of the company since its formation, died suddenly in March last. Mr. F. Haines, who was acting-secretary, has been appointed his successor.

Annual meeting: November 10th.

Yates and Thom, Ltd.—The net profit for the year ended August 7th, after providing for depreciation of plant and machinery, interest on mortgage debenture stock, and writing down investments to market value, is £36,553, plus £8,428 brought forward. The directors propose to pay one year's dividend on the ordinary shares at 10 per cent., less tax, transfer to reserve fund £20,000, and carry forward £8,346. —*Financial Times.*

West India and Panama Telegraph Co., Ltd.—The directors recommend the following dividends:—6s. per share on the 1st and 2nd pref. shares, for the six months ended June 30th, and 9d. per share on the ordinary shares, free of income-tax.

Huelva Gas and Electricity Co., Ltd.—A financial contemporary says that the directors announce that it will be impossible to provide the interest due on November 11th next on the debenture stock.

New St. Helens and District Tramways Co., Ltd.—A dividend of 2½ per cent. (2s. 6d. per share), on the preference shares is announced. £5,000 has been placed to reserve and £6,557 carried forward.

Kaministiquia Power Co.—The directors have declared a dividend of 1¼ per cent., or at the rate of 6 per cent. per annum on the common stock for the quarter to October 31st.

Brisbane Electric Tramways Investment Co., Ltd.—A dividend of 4s. per share, free of income-tax, on the ordinary shares is announced.

Lisbon Electric Tramways, Ltd.—The directors have declared an interim dividend of 2½ per cent., free of income-tax, on account of earnings of current year.

Parsons Marine Steam Turbine Co., Ltd.—The directors recommend a dividend of 13 per cent. (actual), making 25 per cent. for the year.

Westinghouse Brake Co., Ltd.—Interim dividend of 5 per cent., less income-tax.

Anderston Foundry Co., Ltd.—Interim dividend of 4s. 6d. per share, less income-tax.

Delabole Electric Light Co., Ltd.—A dividend of 5 per cent. for the year is announced.

STOCKS AND SHARES.

Tuesday Evening.

The Stock Exchange cannot complain that it has any lack of features in the way of market movements. Within the past week or so such rises have occurred in Brazilian, Mexican, and Canadian securities of all kinds as fairly to merit the designation of breathless. A good deal of it, of course, has been somewhat artificial. Where there is little stock on offer and a good deal of demand, prices go up with a swing; and this is what has happened in the cases of the utility companies of the three countries mentioned. At home, too, securities are improving in value in many departments: in fact, the Home Railway market is about the only section where there is no appearance of firmness or business.

The heavy rises of last week in Mexican utility issues have been further improved upon during the past few days. At the beginning of the week there came a slight set-back in the general buoyancy, and some of the ordinary issues gave way under quiet pressure to sell. The sudden revulsion of feeling as regards Mexico brought about a lively gamble in New York, and the excitement spread to Montreal, thence to London. A very little inquiry for the utility companies' bonds sent up prices by leaps and bounds, and some holders consider that the rise has been carried quite far enough for the present. It is only necessary to refer to several of the recent reports from Mexican companies to understand how thoroughly exhausted the country is. Food in Mexico City, we read in one of these reports, is at prohibitive prices, because scarcely any crops were sown, on account of brigandage and the confiscation of draught animals.

The exchange was said at the end of June last to be a nominal few pence. The Mexico Tramways, it was recently stated, had lost the controllers off its cars. The Mexican Light and Power Co. was unable to collect its debts, although at the same time it was expected to maintain its upkeep, the purchase of machinery having to be made, of course, in gold, while what takings the company secured were in the frightfully debased currency of the country. Carranza has indeed a colossal task in front of him. Money, no doubt, will pour into Mexico from the United States; but it stands to reason that the Americans will insist upon stiff terms for their financing of the companies. The words Prior Lien and First Mortgage stand an unhappy chance of losing much of their sacrosanctity in the light of what is probably going to happen in Mexico during the next year or two.

Canadians have been booming in consequence of the fresh reports reaching this country as to several of the well-known companies being overwhelmed with war orders. The particular star is Canadian General Electric, the common stock of which rose 10 points in one day, and 7 or 8 more in less than a week; the price has soared to 130, whereas at the outbreak of war it stood a little below par, and in the early part of the present month the price was about 108. The preferred stock is almost neglected, its dividend being fixed and carrying no participating rights. Shawinigan Water common stock further rose to 145. The shares of the various electric lighting and power companies of the United States, as well as Canada, have been eagerly sought after; and, judging from the way in which American rails have been pushed up to almost ridiculous values, there is some justification at least for the buying that is going on in the industrial departments.

Brazil is considered to have definitely turned the corner, and a remarkable feature of the week is the way in which Brazilian Traction common shares have gone ahead. Unlike the improvements in some of the other stocks and shares just mentioned, the rise in Brazil Tractions has been accompanied by a satisfactory amount of business. Montreal as well as London is supporting the shares on this side, and the price is now within easy distance of that current at the time that war broke out—namely, 66. The company's preferred shares have risen at the same time, standing now about 89½. Rio de Janeiro Tramway bonds improved materially, in sympathy with the substantial recovery in all things Brazilian; and the whole of this Latin-American utility list, so dry and stagnant hitherto, is once more a centre of lively animation and keen buying which would have rejoiced the heart of poor Dr. Pearson, the head of the group, who, it will be remembered, was murdered by the Germans in the sinking of the *Lusitania*.

The home markets are generally steady, with the exception of that for Home Rails. The latter is as depressed and neglected as ever: every week, in fact, brings further declines; and what claims the market has to the consideration of investors are entirely overlooked. Central London assented ordinary is easier. There are falls in Metropolitans, Underground Electric ordinary shares and income bonds. Underground income stock, however, is firm at 103¾.

Electricity supply shares are maintaining their prices in most cases; where shares come in, they usually have an effect upon the quotation. County of London, for instance, are easier at 10; and the 4 per cent. debenture stock of the Metropolitan Co. is marked down 5 points to 85.

Debenture stock holders of the South Metropolitan Electric Light & Power Co. are being asked, in a circular signed by the chairman of the undertaking, to support the board's proposals for an alteration of the trust deed. The trustees for the debenture stockholders differ from the board of directors on a point touching the company's obligation to carry a portion of the profits to the credit of the depreciation account. It is unusual for the directors and the trustees for the debenture holders of a company to hold divergent views; but where the security of debenture stockholders is in any way in question the matter is manifestly one that calls for very careful consideration indeed.

The telegraph market is better, the only decline being one of ⅛ in Eastern Extension shares, which have lost the fraction gained last week. Anglo-American Telegraph preferred has again risen, and New York Telephone bonds are a point higher. Up to the present, the results of the Anglo-French Loan in New York have been disappointing and unexpected, for the rate of exchange between the London and New York is no whit more settled than it was before the negotiations began: in fact, the exchange presents serious difficulties to finance at the present time. West India and Panama shares are up ½.

Marconis continue listless. The extraordinary achievement of wireless telephony between New York and Paris brought forth the supposition in the London-American market that, upon the resumption of peace conditions, arbitrage business would be conducted through the medium of speech instead of that of cable. American Marconis are almost as quiet as their parents, but the New York speculation in electric industrials goes on with fierce determination.

Telegraph Constructions are up another £1 at 32½. The rubber market also is good, notwithstanding comparative dullness in the price of the raw material. There is nothing much going on in the armament list; and amongst copper shares the prevailing tendency is still heavy.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend, 1914.	Price Oct. 26, 1915.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.				
Brompton Ordinary	10	7½	—	£6 18 4
do. 7 per cent. Pref.	7	7	—	5 0 0
Charing Cross Ordinary	5	3½	— ¼	7 2 10
do. do. do. 4½ Pref.	4½	3½	—	6 0 0
do. do. City Pref.	4½	3½	—	6 8 7
do. 4 Deb.	4	80	—	5 0 0
Chelsea	5	4½	—	5 17 8
do. 4½ Deb.	4½	87	—	5 3 6
City of London	9	12½	—	7 7 0
do. do. 6 per cent. Pref.	6	10½	—	5 11 4
do. do. 5 Deb.		100	—	5 0 0
do. do. 4½ Deb.	4½	85	—	5 6 0
County of London	7	10	— ¼	7 0 0
do. do. 6 per cent. Pref.	6	10½	—	5 17 8
do. do. 1st Deb.	4½	90	—	5 0 0
do. do. 2nd Deb.	4½	85	—	5 6 0
Kensington Ordinary	9	6½	—	7 4 0
London Electric	4	1⅝	—	8 8 4
do. do. 6 per cent. Pref.	6	4½	— ½	6 13 4
do. do. 4 Deb.	4	80	—	5 0 0
Metropolitan	8½	2½	—	7 15 7
do. 4½ per cent. Pref.	4½	3½	—	6 0 0
do. 4½ Deb.	4½	85	—5	5 6 0
do. 3½ Deb.	3½	70	—	5 0 0
St. James' and Pall Mall	10	6½	—	7 8 2
do. do. do. 7 per cent. Pref.	7	6½	—	5 12 0
do. do. do. 3½ Deb.	3½	70	—	5 0 0
South London	5	2⅞	—	6 19 0
South Metropolitan Pref.	7	1 7/16	—	6 14 0
Westminster Ordinary	9	6¾	—	6 13 4
do. 4½ Pref.	4½	4½	—	5 9 0
Telegraphs and Telephones.				
Anglo-Am. Tel. Pref.	6	102	* + ½	5 18 0
do. Def.	1½	x23	—	6 11 10
Chile Telephone	8	6½	—	6 3 0
Cuba Sub. Ord.	5	8	—	6 5 0
do. Pref.	10	15	—	6 13 4
Eastern Extension	7	11¾	— ⅛	*6 16 2
do. 4 Deb.	4	80	—	5 0 0
Eastern Tel. Ord.	7	120	+1	*6 14 0
do. 3½ Pref.	3½	66	—	5 6 0
do. 4 Deb.	4	82	+1	4 18 0
Globe Tel. and T. Ord.	6	10	+ ⅛	*6 17 0
do. Pref.	6	10	+ ⅛	6 0 0
Gt. Northern Tel.	22	83½	—	6 11 4
Indo-European	18	47	—	6 18 4
Marconi	10	1⅞	—	6 8 0
New York Tel. 4½	4½	102⅛	+ 1	4 7 9
Oriental Telephone Ord.	10	1 3/16	—	5 8 1
do. Pref.	6	⅛	— ⅛	6 17 2
Tel. Egypt Deb.	4½	80	—	5 0 0
United R. Plate Tel.	8	5⅜	—	*8 2 6
do. Pref.	6	4⅞	—	6 2 7
West India and Pan.	1	1/16	— ⅛	8 17 9
Western Telegraph	7	12¼	+ ⅜	*6 11 4
do. 4 Deb.	4	80	—	5 0 0
Home Rails.				
Central London, Ord. Assented	4	68	—1	5 16 0
Metropolitan	1¾	22½	— ¾	5 8 8
do. District	Nil	13	—	Nil
Underground Electric Ordinary	Nil	1½	—	Nil
do. do. "A"	Nil	5/6	—	Nil
do. do. Income	6	70½	— ½	*9 12 6
Foreign Trams, &c.				
Adelaide Sup. 6 per cent. Pref.	6	5	—	6 0 0
do 5 Deb.	5	97	—	5 3 0
Anglo-Arg. Trams, First Pref.	5½	3½	—	7 17 2
do. 2nd Pref.	5½	3	—	9 3 4
do. 4 Deb.	4	74	—	5 8 1
do. 4½ Deb.	4½	74	—	6 1 7
do. 5 Deb.	5	75	—	6 13 4
Brazil Tractions	3½	57½	+7/8	6 1 9
Bombay Electric Pref.	6	10½	—	5 17 1
do. 4½ Deb.	4½	87	—	5 3 0
Mexico Trams	Nil	34	—	Nil
do. 5 per cent. Bonds	—	50	+3	Nil
do. 6 per cent. Bonds	—	44	—	Nil
Mexican Light Common	Nil	30	+2	Nil
do. Pref.	Nil	40	+2½	Nil
do. 1st Bonds	—	10	+4	—
Manufacturing Companies.				
Babcock & Wilcox	14	2 3/16	—	6 8 5
British Aluminium Ord.	5	1 1/16	—	4 14 1
do. Pref.	6	18/8	—	6 9 9
British Insulated Ord.	15	10⅜	— ¼	7 4 7
do. Pref.	6	5½	—	5 2 2
British Westinghouse Pref.	7⅛	84/-	—	8 10 8
do. 4 Deb.	4	72	—	5 11 1
do. 6 p. lien	6	101	—	5 19 0
Callenders	15	11	—	6 16 4
do. 5 Pref.	5	4½	—	5 11 8
do. 4½ Deb.	4½	92	—	4 17 9
Castner-Kellner	15	61/-	—	4 18 6
Edison & Swan, £8 pd.	Nil	10/-	—	Nil
do. do. fully paid	Nil	1	—	Nil
do. do. 4 Deb.	4	57	—	7 0 4
do. do. 5 % Deb.	5	60	—	8 6 8
Electric Construction	6	13/-	—	9 4 8
do. do. Pref.	7	19/9	—	7 1 4
Gen. Elec. Pref.	6	9½	—	6 6 4
Henley	20	12½	—	*9 2 0
do. 4½ Pref.	4½	4½	—	5 0 0
do. 4½ Deb.	4½	92	—	4 17 9
India-Rubber	5	8	—	6 5 0
Telegraph Con.	20	32½	+1	7 12 0

* Allowance made for dividends being paid free of income-tax.

Empire District Electric Co., Ltd.—The directors have declared a dividend of ¾ per cent. The policy of the board is to continue payment of a similar dividend on the preferred stock monthly until all accumulated dividends are paid, and to then disburse the regular dividend of one-half of 1 per cent. each month thereafter.—*Financier.*

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, October 27th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	..	..
a " Nitric	"	..	..
a " Oxalic	per lb.	1/-	..
a " Sulphuric	per cwt.	..	..
a Ammoniac Sal	"	..	..
a Ammonia, Muriate (large crystal)	per ton	£50	..
a Bleaching powder	"	£9	..
a Bisulphide of Carbon	"	£23	..
a Borax	"	£23	..
a Copper Sulphate	"	£28	..
a Lead, Nitrate	"	..	..
a " White Sugar	"	..	..
a " Peroxide	"	..	..
a Methylated Spirit	per gal.	..	..
a Potassium, Bichromate, in casks	per lb.	..	..
a Potash, Caustic (88/90 %)	per ton	..	..
a " Chlorate	per lb.	1/4½	..
a " Perchlorate	"	1/6	..
a Potassium, Cyanide (98/100 %) (for mining purposes only)	"	Nom.	..
a Shellac	per cwt.	65/-	..
a Sulphate of Magnesia	per ton	..	..
a Sulphur, Sublimed Flowers	"	£11 10	..
a " Recovered	"	..	..
a " Lump	"	£8 10	..
a Soda, Caustic (white 70/72 %)	"	..	..
a " Chlorate	per lb.	1/3½	..
a " Crystals	per ton	45/-	..
a Sodium Bichromate, casks	per lb.	5½d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	..	..
b " Wire, in ton lots (1 to 14 S.W.G.)	"	..	..
b " Sheet, in ton lots	"	..	..
g Babbitt's metal ingots	"	..	..
c Brass (rolled metal 2" to 12" basis)	per lb.	1/0¾ to 1/1	..
c " Tubes (solid drawn)	"	1/1½ to 1/1½	..
c " Wire, basis	"	1/1½ to 1/1½	..
c Copper Tubes (solid drawn)	"	1/1½ to 1/1¾	½d. inc.
g " Bars (best selected)	per ton	£103	£3 inc.
g " Sheet	"	£103	£3 inc.
g " Rod	"	£103	£3 inc.
d " (Electrolytic) Bars	"	£88 10	..
d " Sheets	"	£106 10	..
d " Rods	"	£95 10	..
d " H.C. Wire	per lb.	11¼d.	..
f Ebonite Rod	"	8/-	..
f " Sheet	"	2/8	..
n German Silver Wire	"	1/10	..
h Gutta-percha, fine	"	6/10	..
h India-rubber, Para fine	"	2/5½	..
f Iron Pig (Cleveland warrants)	per ton	67/7½	3/1 inc.
f " Wire, galv. No. 8, P.O. qual.	"	£26	..
g Lead, English Pig	"	£25 15	15/- inc.
g Mercury	per bot.	£15 15	..
c Mica (in original cases) small	per lb.	6d. to 8/-	..
c " " " medium	"	8/6 to 6/-	..
c " " " large	"	7/6 to 14/- & up.	..
o Nickel, sheet, wire, &c.	"	Nom.	..
g Phosphor Bronze, plain castings	"	..	..
g " " rolled bars & rods	"	..	..
g " " rolled strip & sheet	"	..	..
o Platinum	per oz.	198/-	8/- inc.
d Silicium Bronze Wire	per lb.	1/3	..
r Steel, Magnet, in bars	per ton	£85	..
g Tin, Block (English)	"	£154 10 to £155 10	£4 15 to £5 15 inc.
n " Wire, Nos. 1 to 16	per lb.	2/7	..
g White Anti-friction Metals	per ton	..	..
k Zinc, Sh's (Vieille Montagne bnd.)	"	Nom.	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

South Metropolitan Electric Light and Power Co., Ltd.—According to a financial daily, a meeting of the debenture holders was called for Wednesday to consider a proposal to vary the trust deeds as regards the amount agreed to be set aside to reserves or depreciation. The existing arrangement allows for 2½ per cent. on the share and loan capital to be so set aside annually until 1923, and the proposal now made is to reduce this to 1½ per cent. on the total capital, less freehold lands and investments, the period to be extended to 1931. Such an alteration should bring nearer the payment of ordinary dividends. The trustees have issued a circular opposing the proposed modification of existing rights.

Trafford Park Estates, Ltd.—The profit for the year ended June, 1915, was £20,792, plus £4,405 brought forward, and the net available profit due to the redemption of chief rent £44,763, makes the available profit £69,960. A dividend of 4 per cent. is to be paid, carrying forward £45,070. The capital expenditure of the year, mainly on new buildings, was £46,897.

THE IDEAL TRANSMITTER.

Somebody defined the piscatorial art as "A rod with a fool at one end and a worm at the other." The telephone may often have a swearing man at one end of the line. It has now, however, reached a high state of perfection; exchanges are wired on the most approved principles, "Cross talk," in both senses of the word has been reduced to a minimum, while the double-pole Bell receiver (which is very nearly perfect) is a marvellously sensitive piece of apparatus.

The chief object of this article is to indicate what is required of a perfect transmitter, rather than to show how it may be constructed.

The advent of the "Hunnings" granular transmitter has done for telephony what the incandescent mantle has accomplished in the gas world.

The chief requirements of an ideal transmitter would be:—

1. Very little or no current used when not being spoken into, though the circuit be closed.
2. Absolute freedom from "frying" and "boiling" sounds and foreign noises of all kinds.
3. No tendency to "pack."
4. It should be loud speaking, that is, its resistance should show great variation with but slight vibration of its diaphragm.
5. Lastly, it should be clear speaking.

The other desirable characteristics, such as cheapness, strength, &c., are more easily attainable.

To deal with things in their proper order, I will begin with No. 1.

The only transmitter, so far as I am aware, which passes no current (whether speaking or not) is one which is constructed on the principle of the condenser, and which varies its capacity in unison with the sound vibrations, and being connected across the line in such a manner that the value of the current flowing through the receiver is varied, it thus transmits speech.

The non-success of this form, though it speaks very clearly, and is absolutely free from foreign noises, is due to its very feeble results, which in turn are due to the difficulty of making a "sensitive" condenser which shall have great variations of capacity.

Coming now to condition No. 2, this is perfectly fulfilled by the above-mentioned transmitter and also by one or two other forms, some of which I believe have not got much beyond the laboratory stage.

If a small mirror be affixed to a vibrating diaphragm in such a manner that a beam of light may be made to impinge upon a selenium cell with greater or less intensity, the said cell being in circuit with a battery and receiver, speech may be thus transmitted.

The objections to this type are, amongst others, the necessity of an illuminant and the unstable and delicate nature of the selenium cell.

As to No. 3, this is one of the great drawbacks of the "Hunnings" granular type, and is due to the gradual settling down of the granules; this may be temporarily overcome by giving the transmitter a half turn occasionally, thus shaking up the particles.

A form was introduced in which the tendency to "pack" was partly prevented by little silk tufts on the back electrode, but was not very satisfactory.

One of the advantages of the "Hunnings" type is the fact that its resistance varies considerably with a comparatively slight movement of the diaphragm; in other words, it is sensitive and loud-speaking. This is due to the great number of points of contact, and, therefore, available paths for the current.

Thus it will be seen that condition 4 is fairly well fulfilled by the "Hunnings"; it is also fairly clear, but if we try to increase its loudness by increasing the voltage, we also increase the "boiling" and foreign noises, &c.

No. 5 is a very important condition, and this combined with loud speaking and freedom from foreign noises would be an ideal combination.

The great point to bear in mind is that a transmitter is required that shall vary greatly in resistance with the comparatively small vibration of its diaphragm, but that it shall not do so in steps; as an instance of my meaning, I may take an adjustable resistance in which the studs are marked 10, 20, 30, &c., ohms, and a water resistance in which a plate of metal is gradually immersed as in a motor starter.

The transition from the minimum current to the maximum current may be as sudden as you please, but it must be continuous, and not rise by jumps like a man going upstairs.

The "boiling" and "frying" in the granular type is caused by actual arcing between the granules and by the making and breaking of a great number of separate and tiny contacts, and is increased by an increase of voltage. The Bell receiver has been used as a transmitter and is very perfect, but the speech, though very clear and absolutely free from "boiling," &c., is too feeble for practical use; it is of course used without a battery, as it generates its own current, which is in this case alternating, besides fluctuating in strength.

Another form utilises the principle of the inductive spiral, that is, a spiral of fine wire is caused to close up and open out by the movement of the diaphragm, thereby varying its self-induction or impedance. This form is quite free from "boiling," &c., but is too feeble.

The difficulties in the way of the production of a perfect transmitter are far greater than those which occur in the design of a receiver; several forms of receiver have been made which are free from hysteresis, impedance, and capacity, which all containing iron and coils of wire, must possess.

The performance of a transmitter is, of course, dependent on a lot of conditions outside itself, such as whether an induction coil is used, the resistance and capacity of the line, receivers, &c., whether the supply is from batteries or power, if from power the type of the line coils, &c., but this article only concerns the transmitter itself.—C. M.

INCREASING THE COST TO THE CONSUMER.

[BY OUR LEGAL CONTRIBUTOR.]

Certain companies and other bodies supplying electricity have recently been compelled to raise their prices. Into the reasons which have compelled them to take this course it is not proposed to inquire at any length. Increased cost of getting and transporting coal and shortage of labour have tended to enhance the cost of running nearly every generating station in the country.

Whatever the cause, retrenchment has become necessary. In the case of a local authority working under provisional order, the increased cost must be borne either by the ratepayer or the consumer. With the fear of the Local Government Board before their eyes, members of Electric Lighting Committees will not unnaturally seek to make the consumer pay the loss. The fact that "profit," so-called, was written off against the rates during the piping times of peace, is not likely to persuade the Local Government Inspector to make the ratepayer pay the loss accruing owing to the war. Consequently the tendency will be to make the consumer bear the brunt. In the case of a company, the decision must be in favour of the consumer or the shareholder; and the directors will not unnaturally seek to protect those for whom they are trustees so far as they can do so within the four corners of the Act of Parliament which has sanctioned their undertaking.

It is proposed to examine the legality of some of the methods which have been, or are being, adopted to prevent electrical undertakings being run at a loss.

It appears that, in some instances, after notice has been given, an addition of 10 per cent., or thereabouts, has been

added to the consumers' account. Can the addition be lawfully demanded? If not, what other courses are open to the supply authority?

It is manifest, of course, that an arbitrary levy of 10 per cent. on each consumer's bill cannot be supported. If the undertakers have agreed to supply electric light at x d. per unit, they have no right to demand $xy + xy/10$, where y equals the number of units registered by a consumer.

On the contrary, if notice has been given to each consumer that at the end of his current contract he will be charged at the added rate, the operation is perfectly legal provided all consumers are treated alike.

From the strictly legal point of view, therefore, no lawyer acting for an electric lighting company or local authority, could advise his client to adopt a sudden 10 per cent. increase as a legitimate way of reducing losses.

It may be that in many cases the added cost of production is so serious that it will be necessary for the entire scale of charges to be revised. Current contracts being observed to the letter, it will be competent for those supplying electricity to increase the charge per unit, provided the statutory limits are not exceeded, and provided (further) that no preference is shown to any consumer or class of consumers. Thus the lighting rate must be raised uniformly in the district, and the power consumers, as a class, must also be uniformly treated. The method to be adopted for increasing rates is clearly laid down in the Electric Lighting Acts, which, of course, do not make any provision for expediting matters owing to the exigencies of a European war.

It is worth while to glance at them. The maximum prices usually allowed to be charged by provisional order are: "(1) Where the undertakers charge any consumer by the actual amount of energy supplied to him at the following rates per quarter: For any amount up to 20 units, 13s. 4d., and for each unit over 20 units, 8d." (Electric Lighting Clauses Act, 1899, Schedule, Clause 31). Lower prices than these are sometimes inserted, but so long as the statutory limit is not exceeded, electric supply undertakers, whether local authority or company, may charge what they like by agreement. Thus by Clause 33 of the Schedule above referred to: "Subject to the provisions of the special order and of the principal Act, and to the right of the consumer to require that he shall be charged according to some one or other of the methods above mentioned (*i.e.*, the methods by 'actual amount' or electrical quantity), the undertakers may make any agreement with a consumer as to the price to be charged for energy and the mode in which those charges are to be ascertained, and may charge accordingly."

It is to be borne in mind that the powers of the Board of Trade to interfere with the *amount* of charges only extends (*a*) to variation of the maximum charge at certain periods; (*b*) to companies supplying electric light. The Board has no power to alter the charges made by local authorities.

The conclusion of the whole matter is that but little can be done to impose the burden on the consumer until such time as his agreement with the undertakers runs out.

DECIMAL COINAGE AND THE METRIC SYSTEM.

(*Continued from page* 517.)

The Standard Electrical Co., of Keighley, "quite agree that Continental business relations would be greatly facilitated by the universal use of the metric system in its entirety," and Messrs. Dorman & Smith, Salford, say: "Although we recognise the difficulty of introduction, we should very much welcome the general use of the decimal system in everyday commerce." The Sterling Telephone & Electric Co., Ltd., say: "Experience in the actual country where decimal coinage is used will only convince British manufacturers of its real importance."

Mr. L. M. Waterhouse, managing director of Messrs. Simplex Conduits, Ltd., writes:

I have all along been very much in favour of the introduction of the decimal coinage and the metric system, which, I feel confident, if generally adopted would tend to the simplification of business, the extension of Continental trade, and probably result in greater all-round accuracy and uniformity.

In addition to the above, the general adoption of the metric system would most certainly simplify calculations, the preparing of price-lists, and obviate continual reference to tables and the mistakes, annoyances and delays which frequently occur in business relations with Continental and foreign customers.

As my replies to your questions show, I have not as yet taken any steps to introduce the decimal and metric system in connection with this business, as I feel strongly that individual effort in this direction would only tend to further complication, and I am of the opinion that nothing but a general adoption of the decimal coinage and metric system throughout the country will do any lasting good and put us in a position to compete on an equal basis with other nations

Messrs. Best & Lloyd, Ltd., Birmingham, say:

We have advocated this for many years. We believe that had we not adopted the system years ago in connection with our foreign trade, the latter would have gradually ceased—instead of growing, as it did until the war broke out.

Messrs. Higgs Bros., Birmingham, are in favour of the adoption of both decimal coinage and the metric system, but remark that "all English screws and diameters are fixed in inches at present, and the use of the metric system necessitates using both measures on the same drawings, which is very confusing." We may point out, however, that in practice the use of both systems on one drawing, if required, is not necessarily found confusing (see letter from the Cambridge Scientific Instrument Co., Ltd., below).

Messrs. H. W. Smith & Co., Ltd., of Lydbrook, say they "have recently felt the necessity of the adoption of the metric system entirely, and hope the time of its adoption will not be long delayed." Similarly the Walsall Electrical Co., Ltd., say that, in their opinion, "it is imperative if we intend to capture the Continental and American business." A firm in the North, replying in the affirmative, says "it cannot be denied that the use of the British system of weights and measures is a considerable obstacle to British foreign trade."

Messrs. G. P. Wall say:

We are ardent advocates of the all-round adoption of the metric system, as it is much simpler than our own cumbrous system. For this reason, our opinion is that the metric system would tend to greater efficiency.

Messrs. S. Bowley & Son, London, say:—

We are certainly in favour of the general adoption in this country of both decimal coinage and metric weights and measures, provided the obstacles are not too great. One has to bear in mind that there are in the country thousands of pounds' worth of packages in actual use made on English weights and measures. Then again, all weighing and filling systems in use would have to be discarded or re-adjusted, and this would entail considerable expenditure, which might not be regarded as worth while or necessary. With regard to coinage, it would take a long while to introduce new values, and there are various other points to be considered.

Messrs. Isenthal & Co., London, welcoming our attempt to crystallise the opinion of English manufacturers on the subject of uniformity in weights and measures, write:—

We have for a long time past felt the urgent need of bringing English catalogues into line with those of Continental manufacturers by weights and measures in units which are intelligible and of direct comparative value to the Continental buyer. There is, however, one difficulty which we have met with in practice, and that is, that though we endeavour as far as possible to dimension our workshop drawings on the decimal system, we have often to depart from this system because the material is not obtainable at present without much difficulty and extra expense in decimal dimensions—for instance, taking brass or steel rods which are to be worked up in the turret lathe, and which we desire to have 12 mm. in diameter, we have to take ½ in. material as it is available, and as it adds too much to the expense to turn it down to 12 mm., the finished article is left at ½ in. A similar thing applies to the thickness of sheets, which at present can only be obtained in S.W.G. or some other gauge, and not in millimetres.

Again, we still have to adhere, especially for Government work, to the B.A. system of threads and to the Whitworth

system for ordinary engineering practice, so it seems to us difficult at the present time to carry through a thorough reform.

It is different with regard to coinage and weights, and the advantages of the decimal system are so obvious that we cannot understand how anyone could hesitate to undergo the slight initial hardships of mastering this system.

As a matter of fact, the British Association system of screw-threads is entirely metric. We shall deal with the question of screw-threads later.

Messrs. Ozonair, Ltd., London, write that they are entirely at one with us in our aims:—

Generally speaking, we are in favour of both decimal coinage and metric weights and measures, provided both are adopted and used for engineering and technical work generally. We would point out to you, however, that even in those countries where the decimal system is standardised, a large bulk of general or ordinary transactions are conducted in the special weights and measures appertaining to the particular country.

That is of little consequence—we are mainly concerned with the development of our export trade at the moment.

The whole of the foregoing firms support the adoption of decimal coinage as well as of the metric system. There are those, however, who approve of one without the other, as we have already remarked. For instance, the Westminster Tool & Electric Co., London, oppose decimal coinage, and while they approve of the metric system, they think, desirable as its adoption is, it should come into use gradually, and not as a result of forced legislation. A Northern firm, on the other hand, is in favour of decimal coinage, but not metric measures, as the latter would mean "such a large expenditure in new jigs, gauges, and drawings, or alterations to those already existing." Again we question the accuracy of this supposition. Messrs. Wilson Hartnell & Co., Ltd., Leeds, also have no objection to decimal coinage, but prefer a binary system of weights and measures. They would like our present system amended to remove the factors 7 and 11:—

The decimal system facilitates calculation, and is most convenient in dealing with small quantities and ratios of quantities, as in photography and theoretical chemistry, but is not convenient for dealing in ordinary commercial goods. The only excuse for introducing the metric system is that our measures of area and bulk are so varied and require standardising on a simple basis.

A very important firm, which desires to remain anonymous, favours decimal coinage, but does not wish for the adoption of metric weights and measures, "in view of the amount of work involved in changing workshop standards, drawings, etc.," a view which we do not share. Messrs. T. Harding Churton & Co., Ltd., Leeds, think that the advantage to be gained by a change in coinage and weights and measures may be easily exaggerated, and it is open to question as to whether the advantage would justify the trouble which making a change would involve; they think it best to leave changes of this kind to come about gradually, as a natural development rather than by a general upheaval. Messrs. W. T. Henley's Telegraph Works Co., Ltd., London, say the question is a very big one; from the point of view of their own business, they at present consider that the disadvantages would outweigh the advantages. Messrs. Hick, Hargreaves & Co., Ltd., Bolton, have used the metric system in certain cases, and are "quite of opinion that there is a great deal to be said for its adoption," but hardly think that the time is ripe at the moment, in view of the upset in the engineering world caused by the war. A London firm answers the questions in the negative, but adds, "Our reply under No. 4 would be modified if there was a consentient opinion amongst manufacturers in the country in favour of adopting a decimal coinage and the metric system." A similar attitude is adopted by Messrs. Rhodes Motors, Ltd., Doncaster, who state that they are members of the B.E.A.M.A., and would only be too pleased to come in line if the plan had to be adopted by other members. The Endolithic Manufacturing Co., Ltd., London, say that they "constantly use the metric system and decimal coinage," but prefer not to adopt a definite policy off-hand. The Wilson-Wolf Engineering Co., Ltd., Bradford, think "it might be convenient to use decimal *weights*, if not decimal measures, in which case it would be logical to use decimal coinage; but the soveregn should be the unit, divided into florins, each florin containing 10 cents and 100 mils." Another firm is not prepared to discuss the question, as the Engineering Standards Committee has so recently set up definite figures, which have been almost universally adopted. We shall refer to this question in due course. Messrs. Marshall, Sons & Co., Ltd., Gainsborough, are opposed to the changes under consideration, their objection to the adoption of the metric system being that, with so many established sizes of various parts of their machinery, they would either have to "convert the existing sizes into decimals, which would in many cases run to three or four decimal points (which you will readily understand would be confusing to our workmen), or we should have to alter our sizes to bring them to even figures in the metric system, which would be out of the question." This point also will receive our attention later. We conclude this section of the subject with extracts from two very interesting letters, and a table giving the names and businesses of the firms that have replied to our inquiries, except where they have asked for anonymity, together with the sense in which they have "voted" on the questions 4 (*a*) and 4 (*b*).

Messrs. W. Sisson & Co., Ltd., Gloucester, write as follows:—

We are not in favour of adoption in this country of decimal coinage.

As to the exclusive adoption of metric weights and measures, we certainly admit the enormous advantage of the simplicity of correlated weights and measures under some system or another, and if such a system is to be adopted, there is now, we consider, no question but that the system universally known as the metric system must be adopted. We are, however, seriously impressed (1) by the fact that an enormous preponderance of mechanical construction of all kinds has been carried out under the British measurements, and has found its way to countries all over the world, whether they are countries which have adopted the metric system or not. (2) Even where British or American firms have worked on the metric system we have noticed that they have, in many cases, still retained the Whitworth standard screw dimensions. (3) The exclusive adoption of the metric system in works unfortunately involves the practical destruction of nearly every gauge, and also a modification of every tool, and even if the Whitworth screw system is retained, the question of destruction, disuse, or modification of standard apparatus of all kinds is a very serious matter. It appears to us, therefore, that compulsory adoption of the metric system would be too serious an interference with the mechanical constructive practice in this country. . . . It is quite clear that any radical change in the direction of a decimal system or correlated weights and measures must be the adoption of the French metric system, since this has, of course, been for many years firmly established in the usage of physicists and chemists, and its use for practical mechanical construction of all kinds has very largely increased.

Mr. C. C. Mason, joint managing director of the Cambridge Scientific Instrument Co., Ltd., writes:

We employ the metre as a unit of length—or, more correctly, the millimetre—in our shops for practically the whole of our manufactures. Occasionally on large work, where no great accuracy is required, inch measurements are used, but we do not hesitate to use both systems of units in the same drawings, according to convenience. Similarly, with regard to weights, both the gramme and the ordinary English measures are equally used in our shops. Not even abroad does the metric system seem to be applied to the measurement of time; consequently, we only have the English system for use in this case. On the other hand, when dealing with electrical units only the metric ones exist; consequently, here we only use one system. To reply, therefore, to your questions in detail, we employ both the metric and other systems in our correspondence with both English and foreign clients. We might add that low temperatures seem to be measured on the English scale almost universally in this country, but that high temperatures are measured on the metric scale by the great majority.

2. (*a*) Our English catalogues are generally produced with terms in both metric and English measures, but the class of customer for whom the catalogue is intended is always borne in view, so that possibly only one system is required, or is given the chief prominence.

(*b*) When publishing foreign lists, when prices are included, they are generally put in the coinage of the chief country using that particular language. It is necessary to remember that a German list may be used in Austria, a country which does not use German coinage.

3. We have already answered.

4. (*a*) The writer personally is not particularly in favour of the decimal coinage. In practice it is not so convenient. There are great merits in our particular sub-divisions of the pound.

(*b*) The writer is certainly not in favour of the English measure being entirely abolished, and the metric system being made compulsory. The present arrangements of both systems being permissible seem satisfactory, and it certainly would not be practical to entirely abolish the English units. It is quite easy to apply the metric system to English units, only one unit being used at a time. For instance, weights should be given in tons or pounds, decimals being used as required. Weights should not be given in tons, cwt., quarters, and lb. simultaneously. This reform should be brought about by a gradual education of the business world. In this no doubt the technical Press can help.

5. These remarks represent the writer's personal opinion. He cannot speak for other members of the company. With this explanation, you can make any use of the above that you like.

ADOPTION OF DECIMAL COINAGE AND THE METRIC SYSTEM.

Those in Favour.

Style of Firm.	Manufactured Products.
Anderson Boyes & Co. Ltd.	Electrical machinery.
A. P. Lundberg & Sons	Electric light switches, etc.
Associated Battery Co., Ltd.	Primary batteries.
*Aster Engineering Co. (1913), Ltd.	Internal-combustion engines.
†Bastian Electric Heating Synd., Ltd.	Heating apparatus.
†Bat Meter Co., Ltd.	Electricity meters.
Best & Lloyd, Ltd.	Electroliers.
British Mica Co., Ltd.	Mica.
British Thomson-Houston Co., Ltd.	Electrical machinery and apparatus.
British Xylonite Co., Ltd.	Celluloid.
C. A. Vandervell & Co.	Car-lighting equipments.
Connolly Bros., Ltd.	Insulated wires and cables.
D. H. Bonnella & Son, Ltd.	Electrical accessories.
Donovan & Co.	Electrical apparatus and switchgear.
Dorman & Smith, Ltd.	Switchgear, fuse-boards, etc.
D. P. Battery Co., Ltd.	Accumulators.
*Duncan Stewart & Co., Ltd.	Steam engines.
E. Brook, Ltd.	Electric motors.
Eckstein Heap & Co., Ltd.	Electrical apparatus.
Edgar Allen & Co., Ltd.	Steel.
Electric Control, Ltd.	Electrical apparatus.
†Erith's Engineering Co., Ltd.	Steam plant.
Etchells, Congdon & Muir, Ltd.	Electric lifts.
Falk, Stadelmann & Co., Ltd.	Electrical apparatus.
Ferranti, Limited	Electrical apparatus.
Foster Engineering Co., Ltd.	Transformers and lamps.
Fredk. Braby & Co., Ltd.	Iron tanks and cisterns.
G. Brady & Co.	Electric lifts.
General Electric Co., Ltd.	Electrical machinery and apparatus.
G. P. Wall	High-grade steel and steel wire.
Griffiths Bros. & Co.	Paints and varnishes.
G. St. John Day (Patents), Ltd.	Electrical accessories.
Harry W. Cox & Co., Ltd.	X-ray apparatus.
Higgs Bros.	Dynamos and motors.
H. W. Smith & Co., Ltd.	Insulated wires and cables.
International Electric Co., Ltd.	Telephones, bells, etc.
Isenthal & Co.	Heating and cooking apparatus.
J. F. & G. Harris, Ltd.	Wood casings and fittings.
John Tullis & Son., Ltd.	Leather belting.
Joseph Sankey & Sons, Ltd.	Iron stampings.
Lea Recorder Co., Ltd.	Water consumption recorders.
L. M. Waterhouse (Simplex Conduits, Ltd.)	Conduits, fittings, etc.
London Electric Firm	Electrical apparatus.
London Label Co., Ltd.	Labels.
London Shafting & Pulley Co.	Shafting and pulleys.
Major & Co., Ltd.	Insulating materials.
Marryat & Place	Electrical apparatus.
Mawdsleys, Ltd.	Dynamos and motors.
M—L Magneto Syndicate, Ltd.	Ignition magnetos.
Morley Electrical Engineering Co., Ltd.	Mining plant.
Mosses & Mitchell	Vulcanised fibre.
Muirhead & Co.	Telegraphic apparatus.
Newton Brothers (Derby), Ltd.	Dynamos and motors.
Park Royal Engineering Works., Ltd.	Electrical apparatus.
Pitman, Cesar & Co.	Water-power plant.
Premier Electric Heaters, Ltd.	Heating and cooking apparatus.
Premier Gas Engine Co., Ltd.	Gas engines.
Pulsometer Engineering Co., Ltd.	Vacuum pumps.
Rhodes Motors, Ltd.	Motors.
*Robt. W. Paul	Electrical instruments.
St. Helens Cable & Rubber Co., Ltd.	Insulated wires and cables.
Sandycroft, Ltd.	Electrical machinery.
S. Bowley & Son	Oils and varnishes.
Standard Electrical Co.	Motors and fans.
Sterling Telephone & Electric Co., Ltd.	Telephones, etc.
Stirling Boiler Co., Ltd.	Steam boilers.
Synchronome Co., Ltd.	Electric clocks.
Venner Time Switches, Ltd.	Time switches and signs.
Walsall Electrical Co., Ltd.	Electrical apparatus.
Ward & Goldstone	Electrical apparatus, wires and cables.
Wardle Engineering Co., Ltd.	Lanterns and fittings.
W. E. Burnand & Co.	Electrical apparatus.
Westminster Engineering Co., Ltd.	Electrical apparatus.
†Westminster Tool & Electric Co.	Electric drills, blowers, etc.
W. F. Stanley & Co., Ltd.	Mathematical instruments.
Whipp & Bourne, Ltd.	Switchgear, rheostats, etc.
Wilson Apparatus Co.	Induction coils, transformers, etc.
*W. R. Sykes Interlocking Signal Co., Ltd.	Railway signalling apparatus.
"Z" Electric Lamp Mfg. Co., Ltd.	Tungsten lamps.
A	Dynamos.
B	Insulated wires and cables.
†C	Electrical accessories.
D	Arc lamps.
E	?

On the Contrary.

Attwater & Sons	Mica.
*Hawkins Bros. & Co., Ltd.	Insulated wires and cables.
J. H. Heathman & Co.	Ladders, tower wagons, etc.
Joshua Buckton & Co., Ltd.	Machine tools.
Marshall, Sons & Co., Ltd.	Steam engines and boilers.
Reid Gear Company	Gearwheels.
W. Canning & Co.	Electroplating apparatus.
‡Wilson Hartnell & Co., Ltd.	Electrical machinery.
W. T. Henley's Telegraph Works Co., Ltd.	Insulated wires and cables.
A	Slate and marble.
*B	Electrical apparatus.
*C	Mechanical engineers.
D	Electrical machinery.
E	Machine tools.
F	Steam engines.
‡G	Dynamos.
‡H	Electrical apparatus.
I	Steam packing.
J	Electrical instruments.

Neutral or Not Decided.

H. T. Boothroyd, Ltd.	Electrical machinery.
British Insulated & Helsby Cables, Ltd.	Insulated wires and cables.
Endolithic Manufacturing Co., Ltd.	Labels and tablets.
Hick, Hargreaves & Co., Ltd.	Steam engines and boilers.
Kendall & Gent, Ltd.	Tools.
Ozonair, Ltd.	Ozone generators.
Partridges, Ltd.	Screws and rivets.
Sperryn & Co., Ltd.	Accessories and fittings.
T. Harding Churton & Co., Ltd.	Motors.
Willans & Robinson, Ltd.	Steam engines and turbines.
Wilson Wolf Engineering Co., Ltd.	Electrical apparatus.
A	Electrical machinery.
B	Arc lamps.
C	Wire-work.
D	Die sinkers.
E	Accumulators.
F	Engineers' stores.
G	?

*No decision on decimal coinage.
†Opposed to decimal coinage.
‡Not opposed to decimal coinage.

(*To be continued.*)

TRADE STATISTICS OF SIAM.

The following figures, showing the imports of electrical and similar goods into the port of Bangkok during the year ended March, 1915, are taken from the recently-issued official trade statistics; the figures for the year ended March, 1914, are included for purposes of comparison, and notes of any increases or decreases are given. Imports stated to be from Singapore and Hong-Kong are for the most part the products of other countries shipped *via* these two ports.

	1913-14. Ticals.	1914-15. Ticals.	Inc. or dec. Ticals.
Parts of lamps.—			
From Singapore	17,000	9,000	− 8,000
,, Hong-Kong	6,000	7,000	+ 1,000
,, United Kingdom	22,000	11,000	− 11,000
,, Germany	21,000	5,000	− 16,000
,, United States	5,000	7,000	+ 2,000
,, Other countries	14,000	7,000	− 7,000
Total	85,000	46,000	− 39,000
Lamps.—			
From Singapore	58,000	49,000	− 9,000
,, Hong-Kong	33,000	104,000	+ 71,000
,, United Kingdom	66,000	53,000	− 13,000
,, Germany	50,000	15,000	− 35,000
,, United States	3,000	10,000	+ 7,000
,, Japan	93,000	70,000	− 23,000
,, Other countries	7,000	9,000	+ 2,000
Total	310,000	310,000	—
Electrical goods and apparatus.—			
From United Kingdom	297,000	112,000	− 185,000
,, Germany	575,000	167,000	− 408,000
,, United States	155,000	64,000	− 91,000
,, Singapore	24,000	12,000	− 12,000
,, Sweden	2,000	8,000	+ 6,000
,, Italy	12,000	9,000	− 3,000
,, Austria	5,000	11,000	+ 6,000
,, Holland	1,000	7,000	+ 6,000
,, France	25,000	6,000	− 19,000
,, Japan	1,000	70,000	+ 69,000
,, Other countries	27,000	7,000	− 20,000
Total	1,124,000	473,000	− 651,000
Manufactures of brass.—			
From Hong-Kong	469,000	483,000	+ 14,000
,, United Kingdom	58,000	48,000	− 10,000
,, China	102,000	76,000	− 26,000
,, Germany	76,000	5,000	− 71,000
,, Japan	12,000	8,000	− 4,000
,, Other countries	51,000	41,000	− 10,000
Total	768,000	661,000	− 107,000

	1913-14. Ticals.	1914-15. Ticals.	Inc. or dec.	Ticals.
Manufactures of copper.—				
From Hong-Kong	2,000	1,000	–	1,000
,, United Kingdom ...	22,000	36,000	+	14,000
,, Other countries ...	34,000	7,000*	–	27,000
Total	58,000	44,000	–	14,000
* Singapore £4,000.				
Scientific instruments and apparatus.—				
From United Kingdom ...	36,000	43,000	+	7,000
,, Germany	92,000	24,000	–	68,000
,, Austria	11,000	—	–	11,000
,, Other countries ...	39,000	55,000*	+	16,000
Total	178,000	122,000	–	56,000
* France £26,000.				
Rail locomotives.—				
From Singapore	—	4,000	+	4,000
,, United Kingdom ...	9,000	1,000	–	8,000
,, Germany	89,000	61,000	–	28,000
Total	98,000	66,000	–	32,000
Prime movers other than road locos, marine, milling and agricultural machinery.—				
From United Kingdom ...	113,000	27,000	–	86,000
,, United States ...	23,000	1,000	–	22,000
,, Germany	6,000	2,000	–	4,000
,, Other countries ...	5,000	3,000*	–	2,000
Total	147,000	33,000	–	114,000
* Sweden £2,000.				
Machinery unenumerated, including detached parts, and not including textile or sewing machines.—				
From United Kingdom ...	881,000	480,000	–	401,000
,, Germany	124,000	63,000	–	61,000
,, United States ...	56,000	388,000	+	332,000
,, Other countries ...	33,000	33,000*		—
Total	1,094,000	964,000	–	130,000
* Italy £7,000.				
Machine belting.—				
From United Kingdom ...	59,000	62,000	+	3,000
,, Germany	33,000	13,000	–	20,000
,, Other countries ...	3,000	7,000	+	4,000
Total	95,000	82,000	–	13,000
Iron and steel wire manufactures.—				
From United Kingdom ...	49,000	48,000	–	1,000
,, Germany	23,000	12,000	–	11,000
,, Belgium	17,000	10,000	–	7,000
,, Other countries ...	12,000	8,000	–	4,000
Total	101,000	78,000	–	23,000
Railway material.—				
From United Kingdom ...	336,000	529,000	+	193,000
,, Germany	302,000	230,000	–	72,000
,, Belgium	76,000	234,000	+	158,000
,, United States ...	617,000	288,000	–	329,000
,, Other countries ...	44,000	3,000	–	41,000
Total	1,375,000	1,284,000	–	91,000
Cars or trucks for railways or tramways.—				
From Germany	165,000	4,000	–	161,000
,, United Kingdom ...	44,000	233,000	+	189,000
,, United States ...	8,000	5,000	–	3,000
,, Other countries ...	3,000	40,000	+	37,000
Total	220,000	282,000	+	62,000
Caoutchouc manufactures, other than tires.—				
From Singapore	46,000	55,000	+	9,000
,, United Kingdom ...	41,000	28,000	–	13,000
,, Germany	14,000	11,000	–	3,000
,, Other countries ...	6,000	7,000	+	1,000
Total	107,000	101,000	–	6,000

Note: £1 = about 13 ticals.

Board of Trade Inquiries.—The Commercial Intelligence Branch of the B. of T. has lately received further inquiries respecting names of British makers of electric lamps, metal-filament; packing materials, corrugated, for electric lamps; porcelain goods, for electrical purposes; and zinc sheet, for dry batteries.

A Canadian agent (Montreal) desires to get into touch with British makers of hardware and electrical supplies. Particulars can be obtained at the Board of Trade Commercial Intelligence Branch in London.

APPRENTICESHIP IN THE ELECTRICAL CONTRACTING INDUSTRY.

At a recent meeting of the Association of Supervising Electricians, the presidential address was delivered by Mr. A. H. Dykes, and dealt with the subject of apprenticeship in its relation to the new conditions that would obtain after the war.

Not only this country, but the greater part of Europe, would be poorer both in men and in wealth; the whole world would have to set to work to build up again all the good things which the war had destroyed.

Hands, brains, and capital were working together to defeat the ruthless tyranny against which we were fighting, and the same unselfish co-operation would be even more needed in the economic struggle that would begin directly military operations had come to an end.

The happiness of our citizens, the future of our industries, and the prosperity of our nation would depend very largely on the extent to which we could succeed in inducing men to take an increased pride in their work.

Probably, all would agree that the Royal Navy was the most efficient organisation which Great Britain had produced, and one had only to come in contact with the men to see that that efficiency was combined with a very high level of happiness and contentment amongst the workers. If one could succeed in obtaining the same high standard in our industrial army, we should have no more fear of the result of the coming industrial and economic fight than we had of the result when—if ever—the Grand Fleet met the Kiel Canal Fleet.

A boy joined the Navy directly he left school, and immediately came under a strict, but wholesome, discipline. Whilst learning all the practical duties of his profession, he was required to attend during a certain number of hours a day classes forming what was practically a continuation school, these classes being continued for about two years.

What we had to do was to start in a similar way with the young boys just beginning their industrial life, to see that their education was continued after they left the elementary school, to subject them, both at home and in the schools, to firm but kind discipline, to teach them as much as possible of the history and principles underlying their trade, and to try and induce in them a pride and interest in the work of the firm of which they formed a unit, so that they would scorn to scamp their work, and would take a pride in helping to make the products of their firm second to none.

In the old days, a boy wishing to learn a trade was bound apprentice to a master craftsman, who undertook, generally, to feed and clothe him, and teach him his trade. The period of apprenticeship was, normally, seven years, it being considered that this term was none too long for a boy properly to learn his trade, and to reimburse his master by service for the training he had received. The boy was bound to serve his master, to keep his secrets, not to waste his goods, and to obey all his lawful commands, and fairly drastic powers of correction were given to the master in the event of the apprentice proving idle or disobedient. On completion of his apprenticeship, the boy became a journeyman, and was eligible to join the guild, and, in time, to take apprentices of his own.

With the substitution of trading companies for the individual master, and the general change in the whole industrial world brought about by the introduction of power-driven machinery, the system became greatly weakened. To the older, longer-established trades, it still remained the generally accepted channel of entrance; but in many trades the greater proportion of the men now engaged had drifted into the work without any proper training at all.

The need for something to take the place of the old apprenticeship had led to the institution of technical schools, which had necessarily been restricted to evening classes, and, splendid as had been the work which they had done and were doing, it must be confessed that they did not meet all requirements, more particularly for the rank and file of the industrial army.

The average boy of this class left school at the age of about 14, an age when he was only just beginning to be in a position to take advantage of educational facilities, and, only too frequently, he was put to that employment which offered the greatest immediate salary, without any consideration being given to his future prospects. The result was that after a few years, when he wanted a man's job and a man's wage, he could get neither, and joined the army of unemployed.

The standard of discipline, both at home and at school, had fallen very greatly of late years, and, in the absence of any compulsion, it was only the exceptional boy who steadily attended the evening school, and profited by what it had to offer.

Quite apart from this, however, the average course in, say, electrical work, tries to cover so much ground, and to meet the needs of lads in so many different branches of electrical work, that the boy often gets out of his depth, becomes discouraged with the difficulty and remoteness from his trade life to the class work, and gives up before the end of the session. The net result was that only a very small percentage of those entering the electrical contracting trade ever received any systematised training in it.

His own belief was that they would in time have to make attendance for about eight hours a week at a trade continua-

tion school compulsory up to the age of at least 18, this attendance being made in working hours.

In the town of Munich (population 600,000), every boy between the ages of 14 and 18 must attend in the day time the special trade school instituted for members of his trade alone. There were schools for every trade capable of providing more than 20 pupils. These schools were entirely free, and were each managed by a committee representing the trade, the municipality, and the school, the expense being shared equally by the municipality and the trades concerned.

The boys attended for an average of eight hours weekly, between 7 a.m. and 7 p.m., either one whole day or two halves, to suit the convenience of the employers, who were obliged in every case to allow the time, and see that their young employés or apprentices attended. Every boy, whatever his trade, devoted one hour weekly to trade arithmetic and book-keeping, one hour to composition, business letters and reading, and one to citizenship, good behaviour, and hygiene, the remaining time being directed to drawing, and information about his special trade, goods, and tools. During the first two years he did no practical work, as he was supposed to be learning that in his master's shop, but in the last two years he got practical work of a higher grade than he was likely to get in the shop.

The results of these schools had been most excellent, over 90 per cent. of the boys who left the elementary school at the age of fourteen going straight to definite taught trades.

There were signs that the principles underlying the Munich system had found acceptance also amongst many of our leading educationists and business men.

The Gas Light and Coke Co., realising the need for a better system of training boys wishing to become gas fitters, approached the London County Council, and a joint scheme of practical training and general educational classwork had been evolved.

Boys were indentured for a term of four years, commencing between the age of 14 and 16. For the first six months they were engaged in a special workshop, which the company had erected for the purpose, where they learnt the use of tools, and received brief, simple lectures, from the company's foreman, dealing with the practical part of their work. The next six months they went out in the district with the fitters. In the second year, the same routine was followed, the first six months in the shops, at more advanced work, and the next out with the fitters. During the whole of these two years they spent 9 to 10 hours per week, during working hours (generally three afternoons), at the Westminster Technical Institute, where the L.C.C. had arranged a special continuation school for them in mechanical drawing, workshop arithmetic, spelling, punctuation, English composition, and letter writing. After the end of the second year, the education classes were held in the evening, every boy being required to attend two evenings a week (4½ hours) at classes in gas supply and English, and, after the apprenticeship was over, they were still expected to attend at least two evenings a week.

By a system of weekly, monthly, and terminal reports, the company was kept in close touch with the educational work, and could ensure punctual and regular attendance.

The results had been most satisfactory. In summing up the results, the manager of the company, in a paper he read on the scheme some little time back, said:—

"Compare the boy trained as I have described—one who has pride in his work, and a real knowledge of his craft—with one who has been allowed to pick up information anyhow. The one can go all over the world and earn a good wage; the other is, as a rule, amongst those who are only tolerated by an employer, and who are discharged first when work is slack."

Mr. Paul had worked out a somewhat similar scheme at his works for training instrument makers. Perhaps enough had been said to show the lines on which experience had shown that they could best proceed. He would urge the employers in the London district to make a commencement by agreeing on a uniform system of apprenticeship. There should be no premium asked, or, at any rate, only a nominal one. The term should be for at least four years, terminable by the master at any time, in the event of laziness, disobedience, or improper behaviour on the part of the apprentice.

It should be one of the conditions of the indenture that the master allowed the necessary time, and that the boy attended the trade school of his particular trade for at least eight hours per week, during the whole term of his apprenticeship, the classes being, at any rate for the first two years, held during working hours.

He had reason to believe that there would be no difficulty in arranging with the County Council and Board of Education a scheme of combined practical and theoretical education, the masters undertaking the practical work, including instruction by foremen and practical men, and the County Council providing special continuation classes at, say, two convenient centres. These classes could be held in some existing institutes, which were principally used for evening classes and were frequently, not fully occupied during the day.

Both employers and employés would be represented on the board of management, and a healthy rivalry might be created between the lads of different firms, with the result that they would take a pleasure in working to make their shop superior to all rivals. In this way, they would acquire the habit of taking a pride in their work, to their own contentment and happiness, and to the great profit of the nation.

Employers must remember that the goodwill of a firm consisted not in its past history, or in its list of customers, but in the possession amongst its staff and workmen of that love of good work and pride in themselves and their shop, which would not allow them to let a piece of bad work pass them.

Discussion.

In opening the discussion, Mr. Rashleigh Phipps agreed that some such scheme as that outlined by the President was badly needed, and would yield important results. Not the least difficulty was that of the starting wage. A boy fresh from school, with no particular education or training, could earn anything up to a pound a week in blind-alley trades, and, even if he were kept out of the latter, there was always the difficulty of keeping him from leaving his job for the sake of an extra shilling or two a week somewhere else.

Mr. J. M. Crowdy considered that nothing useful could be done in this direction without compulsion. Things had been allowed to drift haphazard; definite, concerted measures should be adopted. Some agreement would be very fruitful, for instance, between their Association and the Electrical Masters' Association in reference to boys now employed in the electrical trade.

Mr. C. J. Banister spoke from experience concerning the difficulty of maintaining good attendance and doing useful work at evening classes. With the best of intentions, boys were physically unable to take on night classes after a full working day. Afternoon classes were essential, though it would often be difficult to spare boys from their practical work to attend them. By giving adequate wages a good deal could be done to induce apprentices to make earnest, steady endeavour. The Liverpool Branch of the Electrical Contractors' Association had adopted a form of indenture including a scale of wages rising from 2s. 6d. a week during the first to 12s. 6d. a week during the fifth year of apprenticeship. That was certainly not adequate remuneration for boys in the London area.

Mr. R. Rankine spoke of the difficulty of getting workers either to work whole-heartedly or to co-operate in schemes for their betterment. The old pride of the craftsman in his knowledge and skill seemed a thing of the past. Their best hope was to get at boys and instill loftier ideals at the very commencement of their career.

Mr. C. R. Bates thought it would be all right for the masters to form an active apprenticeship committee, but any activity of that sort could only be regarded as providing definite proof of the necessity and justification for a national programme. He believed lack of practical instruction in board schools was at the root of the trouble, but nothing less than a national treatment of the whole problem would be really effective.

Mr. H. Marryat described the main features of his own apprenticeship scheme. It was a condition of the indenture that his firm should pay for evening classes and that the boy should attend. Unfortunately, attendance fell off terribly, due, he believed, to the nature of the instruction given.

Other speakers discussed schemes for splitting apprentices into groups so that afternoon classes might be worked without inconvenience, and emphasised the importance of co-operation between night schools and masters of apprentices. Tuition should be adapted to the real needs of the trade, and bonuses might be offered to apprentices making best progress.

Mr. C. R. Bates asked whether something definite could not be done to get a model scheme in operation. The question really lay with the electrical masters; the cost of comprehensive action would doubtless be an obstacle, but something definite ought to be done right away.

Mr. Rashleigh Phipps thereupon suggested that the Association form a committee to discuss the matter with the Electrical Contractors' Association. In the meantime, he undertook to present to the E.C.A. the views expressed that evening.

In reply, the President emphasised the distinction between the proposed continuation classes and ordinary technical classes. A good deal of general education would be included to broaden the boy's mind. Co-operation was essential to secure efficiency, and it might be possible to teach the same matter for a whole week to permit apprentices to attend at the most convenient time. If electrical masters were willing to undertake their share, the Board of Education and the L.C.C. would give assistance in respect of tuition and accommodation.

THE TEXTILE INSTITUTE.

Sir William Mather, of Messrs. Mather & Platt, the president of the Textile Institute, speaking at the Autumnal Congress of the Institute, at Huddersfield, on October 21st-22nd, referred to the importance of mechanical power to the great textile industry. Generally speaking, he said, the inventions and improvements of machinery on which the textile industries depended for their continued development and progress, must come from those whose lives were spent on the manufacture of such machinery. The highest efficiency and economy in motive power, so essential to the success in the textile manufacturing industry, could only be secured by the aid of those branches of engineering occupied with the construction of prime movers worked by steam, gas, hydraulic, and electrical

power. It was astonishing that such a vast industry as the textile industry should have grown to more than ten times what it stood at a hundred years ago without creating for itself a great national—even Imperial—institution to record its progress and achievements at home and abroad, and to promote its continuous development. It was owing largely to the existence of the Institutions of Civil Engineers, Mining Engineers, the Iron and Steel Institute, and the Mechanical Engineers that Great Britain had held the leading, and for a time supreme, position in the metal industries throughout the world almost unchallenged, and, even with the competition of America and Germany, we in this country could rely on these institutes to keep Great Britain at any rate in the front rank. The Textile Institute, which was formed five or six years ago, now intended to assume a national importance, and to pursue a vigorous policy, as the other institutions to which he had referred had done.

Referring to the war, Sir William advised his hearers "when at war to prepare for peace," and declared that our arrangements for conducting trade and commerce, for educating the people, for improving our sociological institutions, and so forth ought to occupy our minds now, so that when peace was declared we could commence a new life with new principles, and with new aspirations and inspiration to make our country what it might have been fifty years ago if these things had been in the minds of our forefathers. The feeling that trade and commerce was to be followed for the advancement of certain individuals was a great mistake. It led them far away from the true patriotism upon which this country would have to depend in the future for its existence. They were, unfortunately, encompassed now in every trade by the new device of limited liability companies, and capital was poured into every kind of industry largely by people who did not even understand what the name of the industry meant, but who only understood the price of stocks and shares and the paying of dividends. They had behind them a great army of working people who were concerned that the profits that were being made were going into the pockets of people far and wide who did not care for the workmen or for anything connected with the industry so long as they got a dividend twice a year. The constitution of our industries on that line was radically wrong, and out of it could never come industrial peace.

The pursuit of wealth was so magnified in the estimation of many people that he thought it had vitiated our English life most terribly. He did not know whether there had ever been a millionaire in the cotton industry. He knew that in engineering the thing was impossible, especially so if a firm were engaged on munitions of war. There would be some revelations about that by-and-by. He thought the engineers would want outdoor relief. His point, however, was that the gain of wealth ought to be dropped as a purpose in life.

In the course of a discussion, later, on "The Economic Effects of the War," Mr. J. F. Crowley (of Messrs. Siemens Bros., London) expressed the belief that the period immediately following the war would be a very busy period, and that the period of depression would come later. He strongly urged that everything possible should be done to encourage our export trade during the war. In his judgment there was nothing more vital, apart from the intensive concentration on the actual immediate object of producing war munitions, than concentration on our export trade; and he was not at all sure that it would not be a desirable thing, even now, to have a special effort made in Government circles to encourage the export trade of this country. After all, it was on our export trade that we depended to pay for the war, and unless our export trade was encouraged, we should not get through the financial part of the war as well as we otherwise might.

Mr. R. S. Dower, M.A. (Lecturer in the Department of Economics, University of Leeds), who had introduced the subject, said that, in his opinion, the disorganisation caused by the stoppage of war work and the difficulty of getting back to normal life would be such that there would be a period of from six to twelve months of comparative stagnation and falling prices immediately following the war. He did not agree with Mr. Crowley on that point, but he did agree with him respecting the importance of keeping up our export trade.

WAR ITEMS.

Royal Engineer Commissions.—The University of London Officers' Training Corps, under the command of Lieut-Col. Capper, commences its eighth year of training this month. The contingent consists of Artillery, Engineer, Infantry and Medical Units. The training is mainly of a continuous character, carried out in or near London. The number of commissions obtained up to August, 1915, is just short of 2,000. The Engineer Unit of the above contingent should appeal strongly to engineers who are desirous of obtaining commissions in the Royal Engineers. Arrangements are made whereby training can be carried on continuously, or for part time only for those men who cannot leave their civil posts until actually gazetted. Candidates for enrolment in the Engineer Unit should apply personally to the O.C. Engineer Unit at the University of London, South Kensington, on Tuesday or Thursday evenings between 5.30 and 7.30 p.m.

American Electrical Exports in July.—The U.S. electrical export trade was over 60 per cent. greater in July, 1915, than in July, 1914. The figures compiled by the Bureau of Foreign and Domestic Commerce show the total increase to have been over 700,000 dol. For the first seven months of 1914 and 1915 there is a difference in favour of the present year of more than 500,000 dol. The principal gains in July were in wire, motors, and telephones. The trade in generators

Electrical Exports for July and for Seven-Month Period.

	July, 1915.	July, 1914.	Seven months ended July, 1915.	Seven months ended July, 1914.
Electrical machinery, appliances and instruments:				
Batteries	$91,344	$59,714	$749,485	$386,231
Dynamos or generators	156,191	195,983	1,232,617	1,632,095
Fans	28,438	23,629	215,268	248,116
Insulated wire and cables	817,379	127,697	1,513,217	863,136
Interior wiring supplies, etc., including fixtures	80,933	45,077	555,964	357,893
Lamps:				
Arc	453	1,672	15,212	28,249
Incandescent—				
Carbon-filament	9,715	3,143	80,202	59,732
Metal-filament	55,929	13,581	346,473	109,037
Meters and other measuring instruments	55,463	31,585	338,993	31,585
Motors	381,695	161,798	1,765,446	2,028,645
Telegraph instruments (including wireless apparatus)	8,536	5,340	58,653	71,749
Telephones	101,277	59,347	632,018	692,515
Transformers	73,292	72,443	346,145	655,125
All others	916,682	614,351	5,321,455	5,466,451
Total electrical machinery, etc.	$2,147,307	$1,415,360	$13,171,148	$12,630,559

showed a slight falling off; in fact, the total for the year up through July is considerably less than for last year. While the motor trade showed a large gain in July, the total for the seven months ended July still showed a large decrease in comparison with the first seven months of 1914. The same is true to a less extent of telephones. The largest total increase during the seven months was in insulated wire and cables, in which trade the value of the 1915 exports was 650,000 dol. greater than that of the 1914 exports. Interior wiring supplies, batteries and meters and other measuring apparatus also registered large increases.—New York "Electrical World."

The Zurich Bank for Electrical Undertakings.—It has been customary to attach importance to the annual reports of the Bank fur Elektrische Unternehmungen, of Zurich, not only because they have generally covered a wide scope, but also because they are issued by an investment and underwriting institution having connections in most parts of the world, and now representing a combined share and loan capital which amounts to about £8,000,000. At the same time, it has to be remembered that the bank owes its origin to the Berlin A.E.G., and there is no reason for assuming that any interruption has taken place in the friendly relations existing between the two companies in the course of years. Bearing this fact in mind, we append the following remarkable extracts from the Bank's report for the year ended with June 30th, 1915.

The report states that the year was under the influence of the world war, which is not only a contest of weapons, but also an economic dispute of an extension and bitterness not thought of hitherto. Government vetoes on payments and exports, naval warfare and blockades, have rendered difficult or hindered the interchange of goods and payments, and the calling up of a large portion of the working population to the Colours has deprived trade and industry of many mental and manual workers. Heavy troubles burden all countries, which stifle the incentive to new undertakings in so far as they are not intended to satisfy the requirements of war. Conditions hitherto unknown in the economic life of nations have been developed, so that it may be said to be almost a wonder how the nations could accommodate themselves relatively satisfactorily to these new and unexpected conditions. The nations cut off from foreign trade have carried out the transition from world economy to an intensive domestic economy without great upheavals, supported by the resolute intervention of the Governments and the enormous orders which devolved upon industry and trade for the satisfaction of army requirements. The money market, which otherwise stood at the disposal of local authorities, trade and industry, is now dedicated to national purposes, since the savings are invested in war loans. By this means, and through the lack of any spirit of enterprise for industrial works, the powers are dried up from which otherwise considerable amounts flowed to industry. An indication of what an indispensable requirement electricity has become is afforded by the circumstance that the electricity supply works, in so far as they are not directly situated in the fighting area, had, until a short time ago, suffered comparatively little under the war, in any case less than what might have been apprehended. After a heavy decline in the receipts from the outbreak of the war a revival soon set in, and in the case of many undertakings the receipts almost reached the level of those of the previous year, and in certain instances they exceeded them. The hampered shipping and the high rates of freight brought about almost everywhere, but particularly in the countries having no national coal mines, a very considerable increase in the cost of fuel, so that notwithstanding comparatively satisfactory receipts, the net profits were frequently less than in the preceding year. In certain countries the scarcity of petroleum has led to a strong demand for current for lighting purposes,

which, however, could not be always met owing to the lack of skilled workmen to carry out the requisite new installations. The works of the undertakings closely associated with the Bank which have suffered the least from these conditions are those which are situated in Germany and Spain, as well as those which utilise water power in Italy. On the whole, the electricity works were able to record a satisfactory course of business. In the case of the tramways, the diminution which took place on the advent of the war has not been counterbalanced in every instance, mostly on account of the lack of a suitable staff.

The report proceeds to remark that, notwithstanding the disturbed times, electrical engineering, in consequence of scientific progress in the branch of the production of certain products by electro-chemical methods, has recorded further important achievements. Thus there are several works in course of construction which serve, among other purposes, for the production of nitrogenous products out of atmospheric nitrogen, according to thoroughly tried processes. Altogether the electrical industry has therefore exhibited great and unexpected elasticity under the different conditions of the period covered by the report. So far great damages through the war, or unrest in the works connected with the Bank, have hitherto fortunately not taken place, and the attempt made in one country at war to bring about a premature dislocation of the concessions of two of the Bank's companies has in the main, been averted by the directors in association with other friendly companies. In other localities concessions had to be made to the nationalistic currents in the sense of occasioning the retirement of deserving administrators and officials from their positions. From the experience of the past few months of the present year the before-mentioned recovery and upward movement in the case of many works, however, has no longer continued at the same rate. The constant calling up of further circles of men engaged in the economic life has not remained without economic effects. The families left behind are compelled to exercise economy and limit their consumption of light; small motors are more frequently at a standstill owing to the absence of many manufacturers and their assistants; and in many cases in the heavy industries the scarcity of skilled and unskilled workers, as well as of certain raw materials, has resulted in a decrease in the consumption of energy. If in these instances some equalisation is in progress through the employment of female labour, changes in occupations, and alterations in the raw materials used in the products of industry, it would be well in any event not to accept as completely assured the continuation of the comparatively favourable situation of the electricity works during the further course of the war. The report, which sets forth in detail the company's investments, is accompanied by the accounts, of which an abstract is given below for the two years:—

	1913-14.	1914-15.
Share capital	£3,750,000	£3,750,000
Loan capital	3,746,000	4,202,000
Gross receipts	641,000	604,000
Interest on loans	152,000	171,000
General expenses, taxes, etc. ...	43,000	45,500
Reserve for war taxation	—	12,500
Net profits and balance forward	412,000	332,000
Dividend	375,000	300,000
,, per cent.	10	8
Carried forward	19,000	19,000

Are Central Station Employés Munition Workers?—An interesting question is engaging the attention of Sir George Askwith, of the Industrial Commission, in consequence of a request made on behalf of employés of the Oldham Corporation, who are members of the Gas Workers' and General Labourers' Union, that a ruling should be given as to whether men engaged at gas works and electricity generating stations are considered as munitions workers. The point urged is that these men, being employed on work necessary to the continuance of work at local factories engaged on munition making, should be classed as munition workers. Last week Sir George Askwith invited a deputation from the Town Council to meet him in London with a view to ascertaining their views. The whole question has arisen in consequence of an application presented to the Oldham Corporation for an advance of wages, and on this question Sir George Askwith intimated during the week-end that he proposed to hold a conference between the parties at the Midland Hotel, Manchester, on the 27th inst. Failing a settlement of the question the men intend to cease work.

Installation Materials in Germany.—As a consequence of the increasing difficulties experienced in the provision of raw materials, particularly metals, and the resulting additional expenditure, together with further rises in wages, the leading makers of installation materials in Germany have raised the prices of most articles by 10 per cent., thus making a total advance of 30 per cent. since the outbreak of the war. The higher prices apply to switches, fuses, lampholders, etc., and have been brought into immediate operation.

Enemy Interests in English Companies.—The "Financial Times" states that in the House of Lords the Earl of Halsbury on an early day will present a Bill to amend the Companies Clauses Consolidation Act in respect of a company of whom the individual corporators are wholly or in the great majority alien enemies.

The Petrograd Lighting Co.—Apparently the Russian Government officials have not yet reached the end of their inquiries into the actual situation and controlling nationality of the Petrograd Electric Lighting Co. of 1886, as it is reported from that city that the police authorities have just made an exhaustive domiciliary examination of the company's offices. Various safes are stated to have been forcibly opened and a number of documents seized. According to German accounts, the examination proves how active is the "famous company for liberation from German yoke," of which the new Minister for Home Affairs is the president.

NEW PATENTS APPLIED FOR, 1915.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

14,365. "Fluid-pressure valves." British Thomson-Houston Co., Ltd. (General Electric Co., U.S.A.). October 11th.

14,377. "Dynamo-electric machines." A. H. Neuland. October 11th. (Complete.)

14,383. "Contact-breakers of induction coils." M. A. Codd. October 11th. (Complete.)

14,396. "Method of laying telephone or telegraph wire." J. E. Neale. October 12th.

14,405. "Electric heating device for cooking utensils, particularly those made of earthenware, glass, china, and metal china." L. Heller. October 12th. (Convention date, July 16th, 1914, Germany.) (Complete.)

14,416. "Automatic electric lock for the doors of railway carriages." J. E. Evans-Jackson (H. R. Sandford, India). October 12th.

14,423. "Frequency multipliers." Marconi's Wireless Telegraph Co., Ltd., and I. Shoenberg. October 12th.

14,436. "Automatic coupling for coupling mechanically and electrically wires, metal cords, and the like." O. Bajma-Riva. October 12th. (Complete.)

14,438. "Device for use principally in recording telephone calls." W. F. Kobabe. October 12th.

14,454. "Electric inspection lamps for use in connection with motor vehicles and the like." C. Bradwell. October 13th.

14,468. "Electric arc soldering and deposition of metals." E. H. Jones. October 13th.

14,482. "Protective devices for electric distribution systems." British Thomson-Houston Co., Ltd. (General Electric Co., U.S.A.). October 13th.

14,484. "Sparking plugs." J. A. Kennedy-McGregor. October 13th.

14,496. "Filling with insulating compound of electric cable junction boxes." W. T. Henley's Telegraph Works Co., Ltd., & F. Harris. October 13th.

14,499. "Guards for the cords or wires of telephone sets." O. Yates, Sen., H. Gambling, & L. F. Parker. October 13th. (Complete.)

14,500. "Radio-telegraphy." J. Bethenod & E. Girardeau. October 13th. (Convention date, October 15th, 1914, France.) (Complete.)

14,503. "Mercury breaks or interrupters on inductive circuits." H. W. Cox and Co., Ltd., & J. P. T. Bruggenkate. October 13th.

14,516. "Dynamo-electric machine for transforming alternating-current into continuous current or *vice-versa*." J. L. la Cour. October 14th. (Convention date, October 14th, 1914, Germany.) (Complete.)

14,533. "Mounting of electrical apparatus in frames or cases." H. B. Prentice. October 14th.

14,539. "Electric arc lamps." H. T. Harrison. October 14th.

14,548. "Electro-mechanical driving arrangements for vehicles and other purposes." H. Reik & Oesterreichische Daimler-Motoren Akt. Ges. October 14th. (Convention date, September 2nd, 1913, Austria.) (Complete.)

14,594. "Membranous or diaphragm transmitters for submarine sound signals." Signal Ges. M.B.H. October 15th. (Convention date, October 15th, 1914, Germany.) (Complete.)

14,630. "Means for holding and adjusting in any required position the carbons of electric arc lamps." W. Mitchell, B. Mitchell, A. Wyndham, and M. Wyndham. October 16th.

14,633. "Dynamo-electric machines." F. A. Heys (Neuland Patents, Ltd., U.S.A.). October 16th. (Complete.)

14,643. "Dynamo-electric machines." F. A. Heys (Neuland Patents, Ltd., U.S.A.). October 16th. (Complete.)

14,650. "Alternating-current electric motors." J. G. Shaw, C. R. Shaw, and H. G. Sharp. October 16th.

PUBLISHED SPECIFICATIONS.

1914.

16,080. Control Systems and Devices for Electric Current. Soc. Anon. des Etablissements L. Bleriot. July 6th. (July 7th, 1913.)

20,176. Method of and Apparatus for Electric Welding, and Article produced thereby. O. C. Knipe & R. H. Read. September 25th.

20,238. Electric Current Relays. J. Schiessler. September 26th. (April 16th, 1914. Patent of addition not granted.)

20,254. Attachment of Electrical Conduit Tubes to Junction Pieces. T. A. Smith & W. H. Owen. September 28th.

20,295. Electric Switches for simultaneously Operating Electric Light, and Camera Shutters. C. H. T. Schmidt. September 29th.

20,458. Prepayment Electricity Meters. Landis & Gyr, Ltd., S.A. October 2nd. (October 1st, 1913. Addition to 18,464/14.)

20,595. Rontgen-ray Apparatus for Localising Bullets and for like purposes. T. Clark. October 6th.

20,920. Junction Boxes, Ceiling Roses, and the like. W. Williams, E. Warbrick, & Anchor Cable Co., Ltd.. October 13th.

21,823. Electric Arc Soldering. E. H. Jones. October 31st.

21,824. Electro-magnetically-operated Valves. A. H. Curtis & Igranic Electric Co., Ltd. October 31st.

22,937. Repeaters for use in Telephone Lines. A. H. Olsson & H. B. M. Pleijel. November 23rd. (December 2nd, 1913.)

23,368. Automatic Regulating Apparatus for Dynamo-electric Machines. V. A. Trier. December 1st.

1915.

771. Arrangement of Transmission Dynamo-meter for Direct Observation. K. Suyehiro. January 18th. (Addition to 9,068/13.)

3,676. Synchronisers. G. T. Van Swaay & H. J. Keus. March 8th. (March 12th, 1914.)

4,987. Hot-wire Alternating-current Limiters. P. Wessel. March 31st.

8,941. Electric Coupling Transformers. J. Schiessler. June 17th. (April 16th, 1914. Divided application on 20,238/14. September 26th.)